

# KraneShares Carbon Suite:

Investing in the Global Carbon Allowance Markets



## Introduction to KraneShares

### About KraneShares

Krane Funds Advisors, LLC is a specialist investment manager focused on China, Carbon, Climate, and other uncorrelated assets. KraneShares seeks to provide innovative, high conviction, and first to market strategies. The firm was founded in 2013 and manages for institutions and individuals globally. In 2017, KraneShares formed a strategic partnership with China International Capital Corporation (CICC) when they acquired a majority ownership stake. The firm is a signatory of the United Nations-supported Principles for Responsible Investment (UN PRI).



## Executive Summary

### Investment Thesis

- Carbon portfolio historically provides annualized returns above the S&P 500<sup>1</sup>
- Structurally designed for long-term price appreciation due to the markets' increasing supply scarcity<sup>2</sup>
- Low correlations to major asset classes, including 0.3 to US large cap<sup>1</sup>
- Provides alternative return profile with potential inflation and climate risk hedging
- Standardized, liquid market valued at \$900B<sup>3</sup>, with nearly 3x growth in trading volume in the last 5 years<sup>4</sup>
- Benefits from structured demand from the program's government-mandated participation for high-emitting sectors

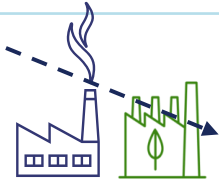



### Impact

- Provides potential impact by supporting price discovery and liquidity in carbon markets<sup>3</sup> while counterbalancing a portfolio's emissions exposure and energy transition/climate risk
- Cap and trade supports fuel switching and capital directed toward innovation in renewable technology<sup>5</sup>

**KRBN****KraneShares Global Carbon  
Strategy ETF****KCCA****KraneShares California Carbon  
Allowance Strategy ETF****KEUA****KraneShares European Carbon  
Allowance Strategy ETF**

1. Data from Bloomberg and S&P Dow Jones Indices as of 3/31/2025. **See slide 19 for supporting data. The performance data quoted represents past performance, and current returns may be higher or lower. Past performance does not guarantee future results. For additional performance and information, please see slide 22.**
2. European Commission, "What is the EU ETS?" retrieved 3/31/2025.
3. Reuters, "Global carbon markets value hit record \$909 bln last year," 2/7/2023.
4. Data from Bloomberg as of 12/31/2024. Based on the 5 largest carbon markets. (See slide 17).
5. International Swaps and Derivatives Association, "Role of Derivatives in Carbon Markets," Sep 2021.

## Compliance vs. Offset Carbon Credits

	Cap-and-Trade/Emission Trading System (ETS)	Carbon Offset
<b>Unit Type</b>	Permit to emit one metric ton of CO2	Verified reduction of one metric ton of CO2
<b>Purpose</b>	Reduce emissions over time for specified regions/industries through a declining annual cap and additional supply adjustment mechanisms	Balance an entity's carbon footprint by investing in projects that reduce or remove emissions
<b>Examples</b>	EU ETS, California Cap-and-Trade, Regional Greenhouse Gas Initiative (RGGI), UK ETS, Washington state C&T, New Zealand ETS 	Building wind turbines or solar farms, supporting methane reduction projects, reforestation, preserving mangroves, carbon capture and storage technology 
<b>Participation</b>	Mandatory (Compliance)	Voluntary
<b>Issuer/Oversight</b>	Central governments and states, government agencies, non-profit corporation 	Issuers are project developers. Oversight is provided by NGOs/independent verification entities. 
<b>Market Size</b>	\$900 billion <sup>1</sup>	\$2 billion <sup>2</sup>
<b>Project-based</b>	No	Yes
<b>Credit Sale</b>	Purchased at auction or (if an entity qualifies) allocated for free	Bought directly from project developers or broker/intermediary

Source: International Carbon Action Partnership, retrieved 3/31/2025.

1. Reuters, "Global carbon markets value hit record \$909 bln last year," 2/7/2023.
2. Reuters, "Voluntary carbon markets set to become at least five times bigger by 2030," 1/19/2023.

## Inflection Point

Emissions Trading System (ETS), or Cap-and-trade, is a government mandated & regulated, standardized, liquid market valued at \$900B in 2023,<sup>1</sup> while the offsets market consists of non-standardized carbon reduction/removal projects collectively worth \$2B.<sup>2</sup>

### Transparent Supply with Mandated Demand



### Mandatory participation for specified industries

Compliance entity examples:

The block displays logos for various compliance entities: RWE, FritoLay, BMW, bp, Anheuser-Busch, Chevron, PG&E, Pacific Gas and Electric Company, Astoria Energy, and PGE.

\*KraneShares/ CliFi models show that 2024-25 is the year we see allowance surpluses going into deficit in certain defined markets.

1. Reuters, "Global carbon markets value hit record \$909 bln last year," 7/Feb/2023.

2. Reuters, "Voluntary carbon markets set to become at least five times bigger by 2030," 19/Jan/2023.

# How carbon allowances can reduce emissions

## Potential Benefits of Carbon Pricing

<b>Auction Revenue</b>	<b>Fuel Switching</b>	<b>Accelerating Innovation</b>
<p><b>Sustainable Communities &amp; Clean Transportation</b> High-Speed Rail</p> <p><b>Social Climate Fund</b> Energy Efficiency for Public Buildings Wetlands &amp; Watershed Restoration</p> <p><b>Energy Efficiency &amp; Clean Energy</b> Expansion &amp; Electrification of Public Transit</p> <p><b>Natural Resources &amp; Waste Diversion</b> Affordable Housing &amp; Sustainable Communities Program Fire Prevention &amp; Urban Forestry Projects</p> <p><b>Greenhouse Gas Reduction Fund</b> Power Plant Decommissioning</p> <p><b>Modernization Fund</b> Electric vehicle (EV) Rebates</p>	<p><b>Coal → Natural Gas → Renewables</b></p> <p>Continue switch to natural gas</p> <p>Switch to solar / wind</p> <p><b>CARBON ALLOWANCE COST</b></p>	<p><b>Fusion &amp; Modular Nuclear</b> </p> <p><b>Aviation Redesign</b> </p> <p><b>Energy Storage</b> </p> <p><b>Carbon Capture Use &amp; Storage</b> </p> <p><b>Renewable Technology</b> </p> <p><b>Energy Intensive Industries</b> </p>

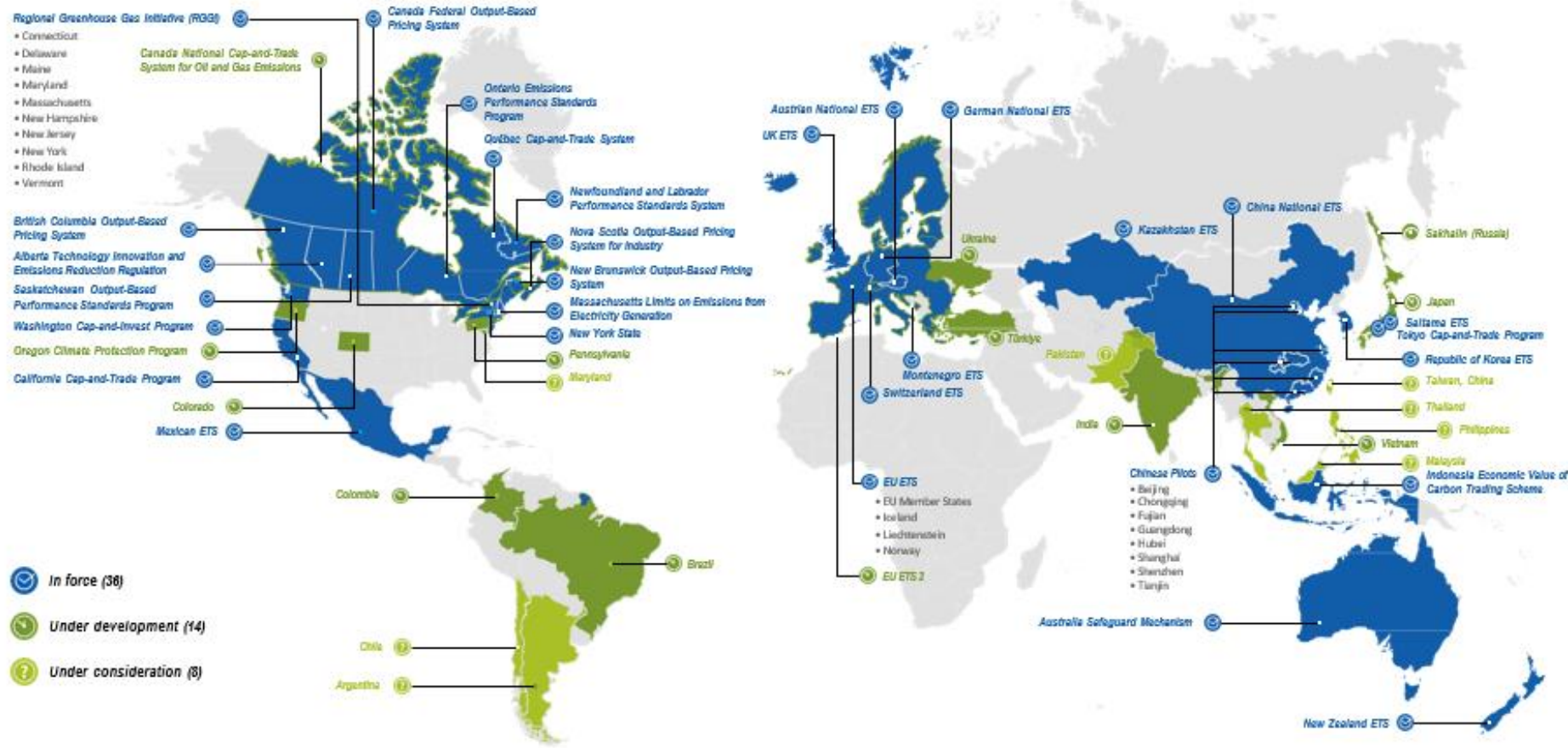
# Global Expansion: Compliance carbon a dynamic market expected rapidly expand across regions

## Expansion of Carbon Pricing is Critical to Achieve Emissions Targets

70+ carbon pricing programs worldwide, covering ~25% of global emissions

The share of global greenhouse gases (GHGs) under an ETS more than tripled since 2005

On average, carbon programs cover just 30% of a country's total emissions at a price of \$25/MtCO<sub>2</sub>e



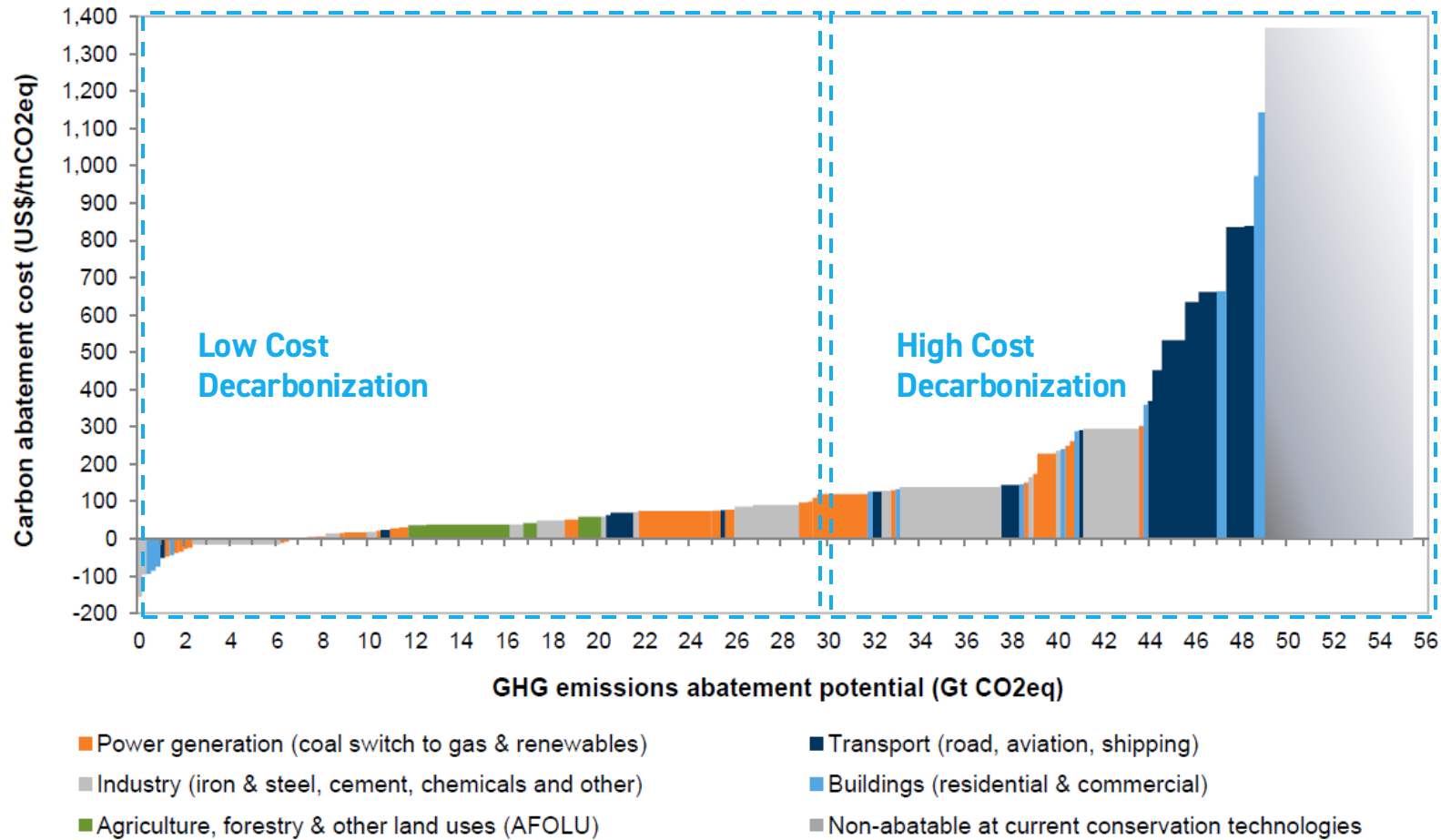
Source: ICAP and Morgan Stanley, "CBAM and the Path to a Global Carbon Price," May 8, 2024.

# Marginal abatement cost curve (MACC)

**Low end:** Fuel switching, power generation, and renewable technologies already developed at scale




**Middle end:** Improved agricultural land and crop management practices, buildings' energy efficiency and energy and material efficiency in industry

**High end:** Heavy industry de-carbonization



Source: Goldman Sachs, "Carbonomics, Updated cost curve shows diverging trends between power and transport," November 27, 2023.

## High Level Overview

	European Union ETS	California Carbon Allowance (CCA) Market	United Kingdom ETS	Regional Greenhouse Gas Initiative (RGGI) Northeast US Power	Washington State Carbon Allowance (WCA) Market
<b>Start of Operation</b>	2005	2012	2021	2009	2023
<b>Region</b>	EU + Iceland, Liechtenstein & Norway	California linked with Quebec	United Kingdom	10 Northeastern US states	Washington State
<b>Regional Emissions Coverage</b>	45%	80%	25%	14%	70%
<b>Sector Coverage</b>					
<b>Cap</b>	1,325.6 MtCO <sub>2</sub> e	317.71 MtCO <sub>2</sub> e	86.7 MtCO <sub>2</sub> e	66.59 MtCO <sub>2</sub> e	53.8 MtCO <sub>2</sub> e
<b>Annual Cap Reduction Rate</b>	4.3% (2024-27), 4.4% (2028-30)	~4% (2021-2030)	Consistent with net zero by 2050	~3% of the 2020 cap (2021- 2030)	7% (2023-2026)
<b>Annual Traded Volume (2024)</b>	\$690.4B	\$72.8B	\$30.2B	\$11.5B	\$1.6B
<b>Total Revenue (Cumulative)</b>	\$206.0B	\$27.0B	\$18.7B	\$7.1B	\$2B

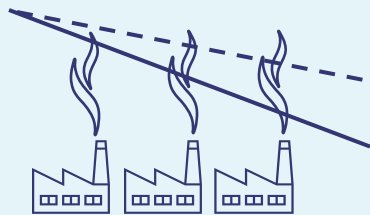
## European Carbon Policy Objectives

- New target: 55% reduction in greenhouse gases from 1990 levels by 2030, up from previous policy targets of a 40% cut.
- Impact: 20% total EU ETS Cap balance decrease in 2024-2030.

### Fit-for-55 Policy Highlights

Overall, 62% drop in the allowance limit from 2005 levels by the end 2030

Accelerates annual allowance cap reduction rate to 4.3% in 2024, and 4.4% in 2028, up from current 2.2%



**Cut to emissions cap**  
-90 million in 2024 &  
-27 million in 2026

#### REPowerEU €20B initiative funded from frontloading EUAs & Innovation Fund

- 40% will be from frontloaded allowances from auctions in 2023-26, meaning allowances set aside for future auctions will be sold earlier
- 60% will come from the Innovation Fund, which finances projects developing innovative, emissions reduction technologies.

REPowerEU: accelerates Europe's transition away from Russian fossil fuels to low-carbon energy sources

#### Lowered price-hike mechanism

to automatically release 75 million allowances from the reserve if, for over six months, the average EUA price is higher than 2.4 times the preceding 2 years. (previously had been 3x)

Provides protection from an excessive rise in the price EUAs over a short period of time

#### CBAM CO2 tax on imports

Starting in 2026



#### Phase-out of free allowances

incrementally starting in 2026, 48.5% phased out by 2030 and complete phase-out by 2034



#### “ETS 2”: new, separate market for building heating & road transport

starting in 2027



#### Social Climate Fund

starting in 2026, funded primarily from the ETS 2 and 25% from participating EU countries

#### Inclusion of maritime emissions: gradual emissions coverage of shipping sector:

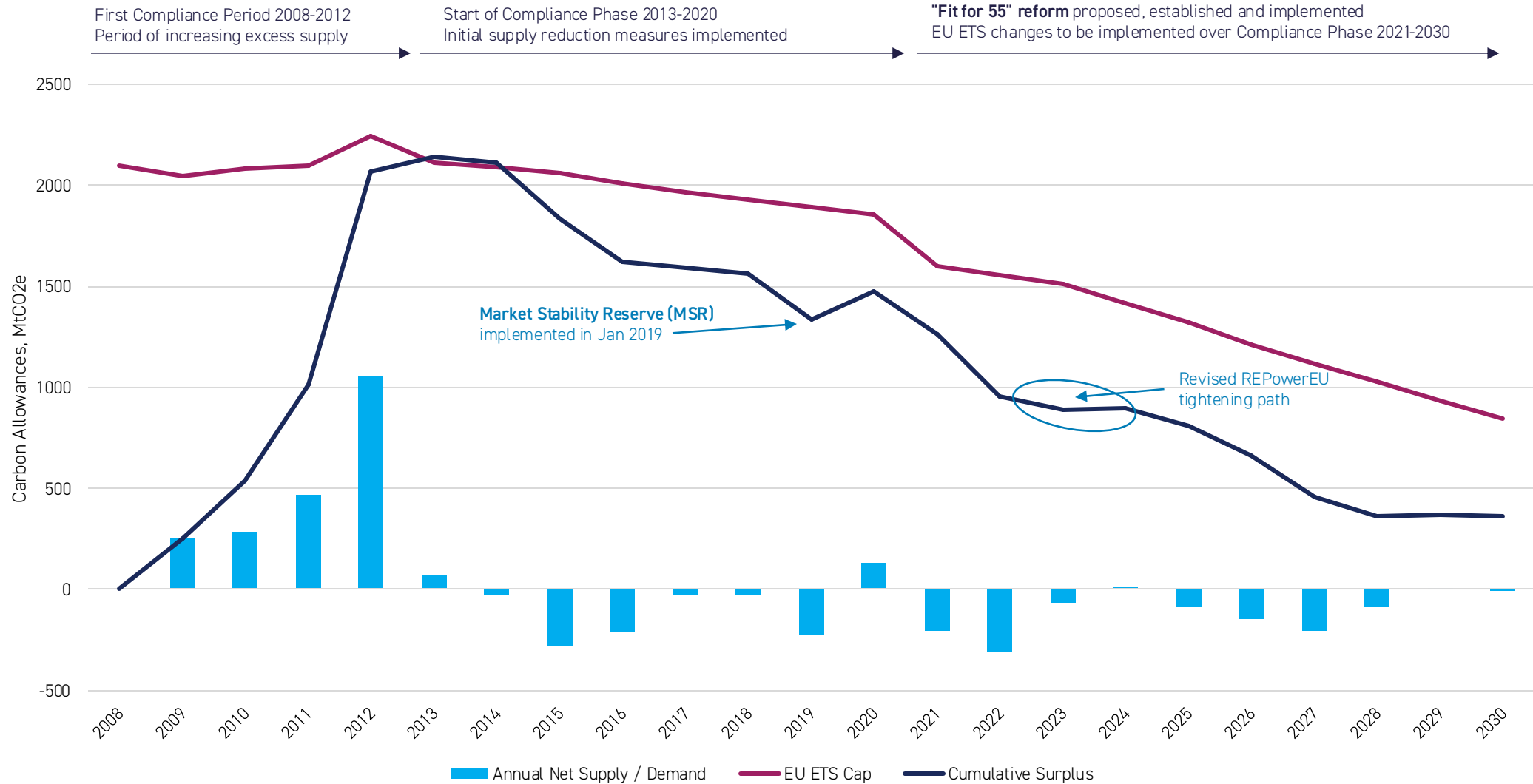
40% by 2024

70% by 2025

100% by 2026

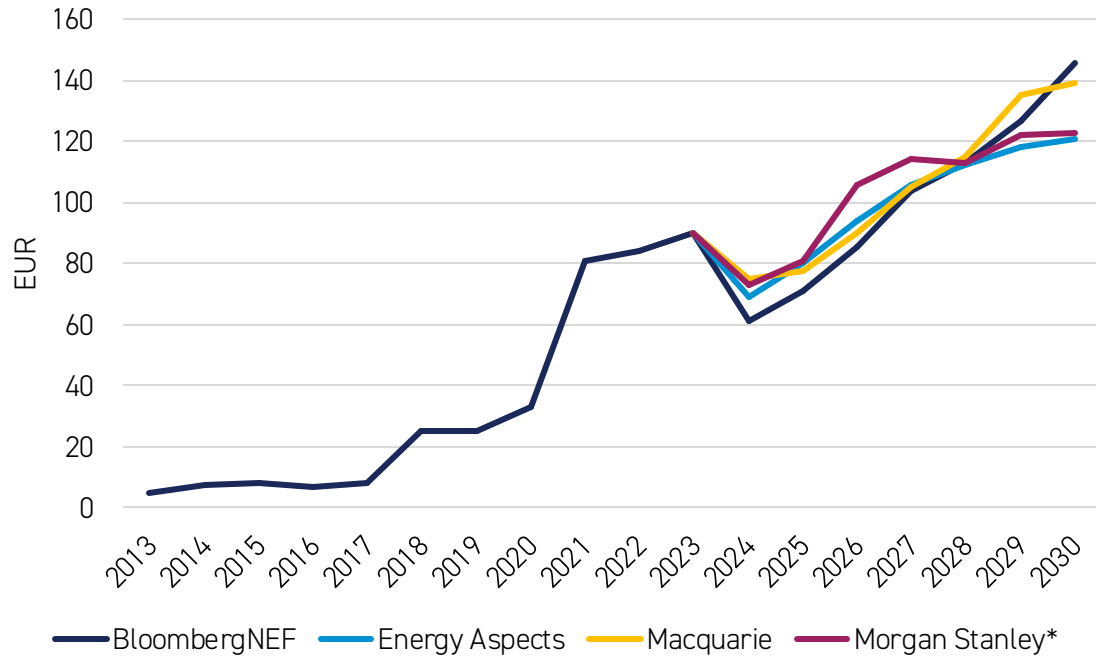


# Supply/Demand Modeling: European Union Allowances (EUAs)



# EUA Carbon Forecasts

EUA Price Forecasts. €/t



	2025	2026	2030
Veyt	€95	€126	€163
BNEF	€71	€86	€145
Macquarie	€78	€90	€138
Energy Aspects	€80	€94	€121
ICIS	€68	€72	€136
Morgan Stanley*	€81	€106	€123

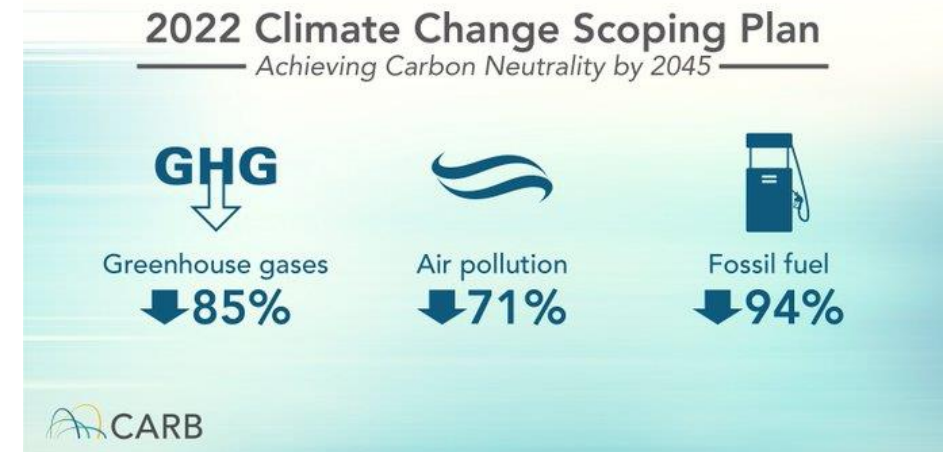
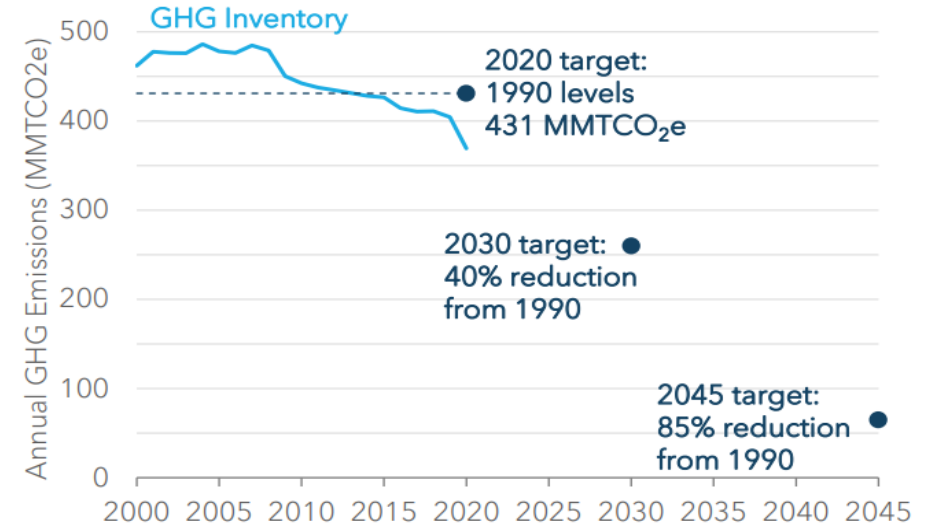
**“[The EU ETS] is the jewel and the workhorse of our climate strategy”**  
**“We are not too worried about the ETS price ... not long ago people on this panel were worried it was too high”**

-- Kurt Vandenberghe, Director-General of European Commission's climate arm

Source: Carbon Pulse, retrieved on 3/31/2025. Price targets are estimates from the sources indicated and do not indicate Fund performance. Prices are annual average, in nominal terms. \*End of period forecast rather than average.

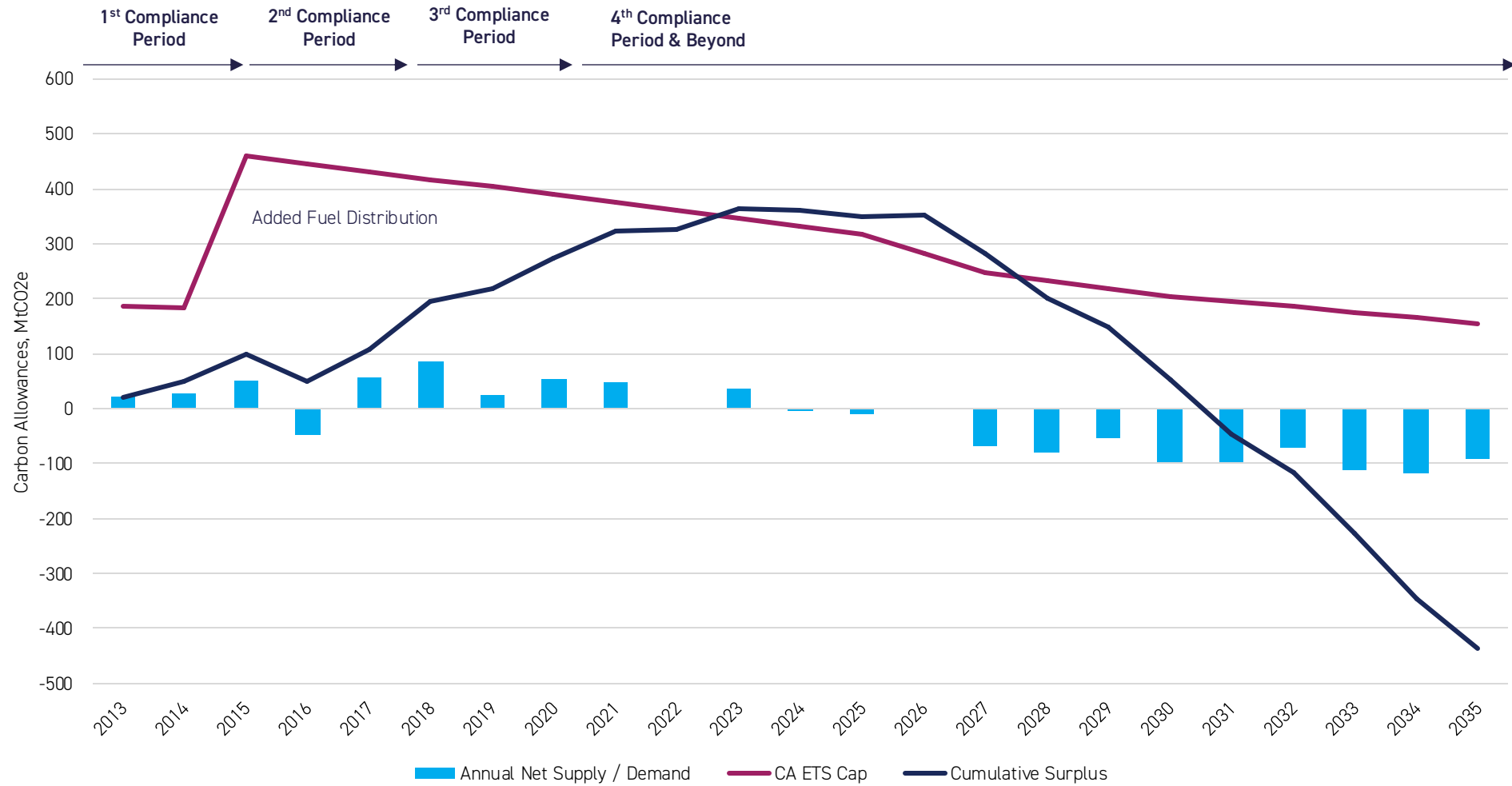
## California Carbon Policy Tightening

- 180Mt removed from the 2026-30 annual emissions budget to align the allowance cap with the 2022 Scoping Plan’s accelerated emissions reduction target of 48% below 1990 levels by 2030 compared to the prior target of 40%<sup>1</sup>
- Annual emission caps reduction rate could increase to 9-14% from the current 4% rate<sup>2</sup>
- Allowances removed from the auctions and free allocation pools of allowances rather than the reserve accounts
- One-time increase in the prices of the cost-containment tier levels
- Overall Impact: CCA market is expected to enter large annual deficits starting from 2027



1. Sources: CLIFI, CARB, "Cap-and-trade Program Workshop", 7/27/2023  
 2. NACW, "Plenary: Status and Outlook for North American Compliance Markets", March 2024

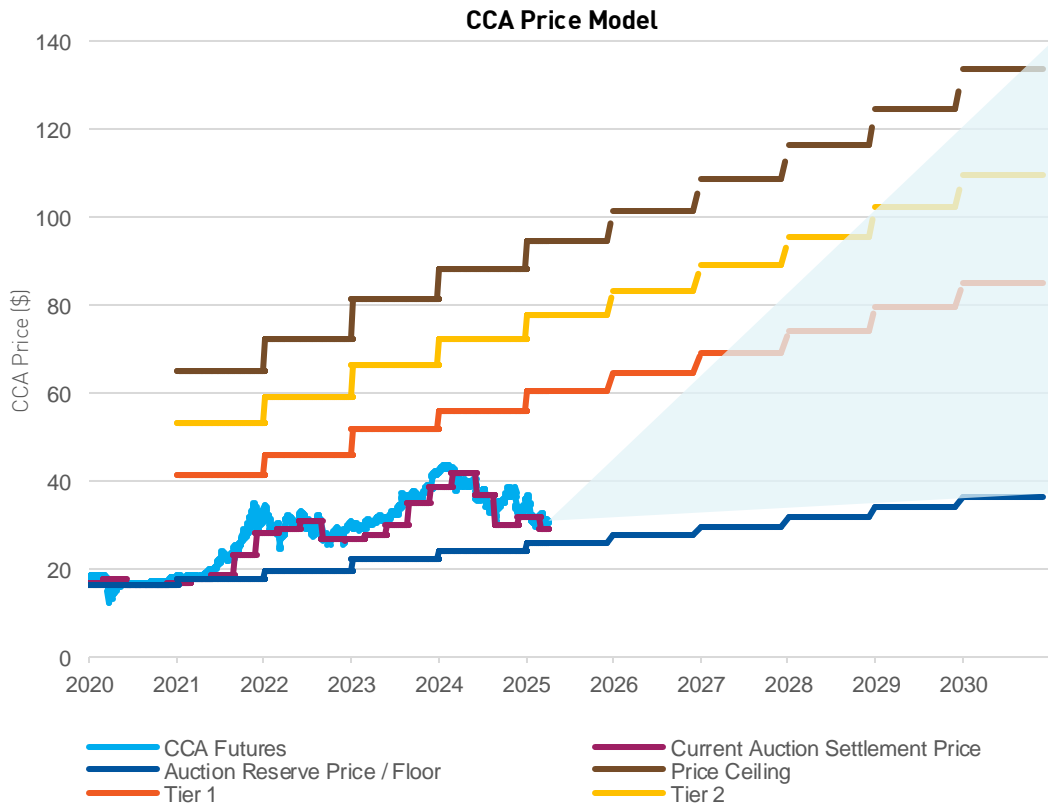
# Supply & Demand Model: California



Proprietary CLIF1 Model. Last updated 3/31/2025. California operates under the Western Climate Initiative (WCI), which administers the shared emissions trading market between California and Québec.

# California's Asymmetric Regime

The price floor and ceiling levels shape the California carbon allowance (CCA) investment opportunity

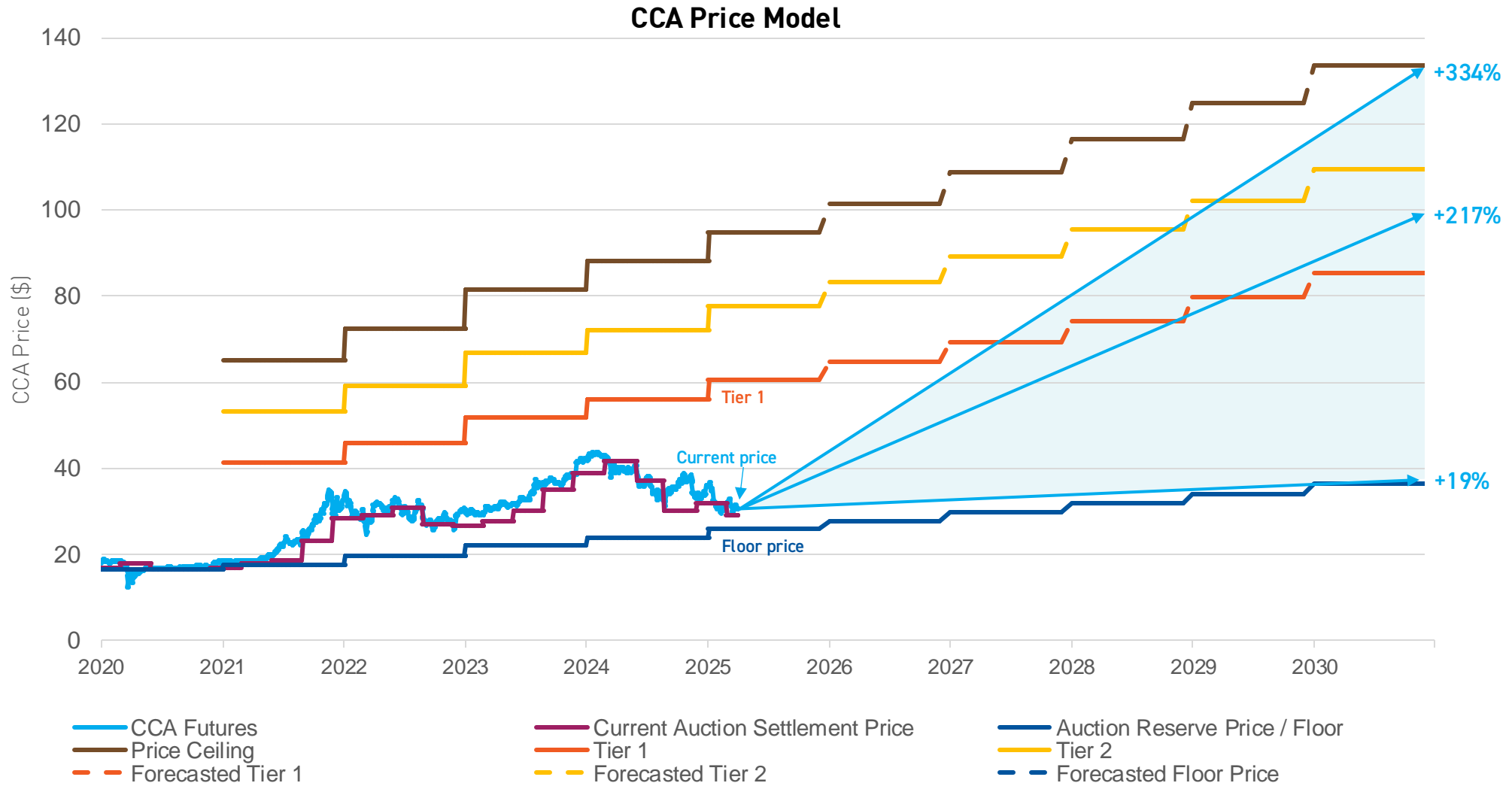


## CCA Price Forecasts

<b>CARB</b>	<b>\$134 by 2030</b>	Based on their alternative scenario modeling for the 48% and 55% targets, with prices moving in line with the price ceiling
<b>BNEF</b>	<b>\$79 by 2030</b>	Based on the 48% emissions reduction target and REPowerEU frontloading
<b>cCarbon</b>	<b>+\$90 by 2030</b>	Based on 48% targets, with the expectation that carbon capture, utilization, and storage (CCUS) and new abatement opportunities will lead to greater decarbonization efforts at higher carbon prices
<b>Clear Blue Markets</b>	<b>\$86 by 2030</b>	Based on the assumption that prices will hit the Tier 1 level
<b>Macquarie</b>	<b>\$101 by 2030</b>	Based Option 1 (48% cap trajectory), assume a 180Mt reduction in allowance over the 2026-30 period, which we expect to come from the allocation and auction budgets

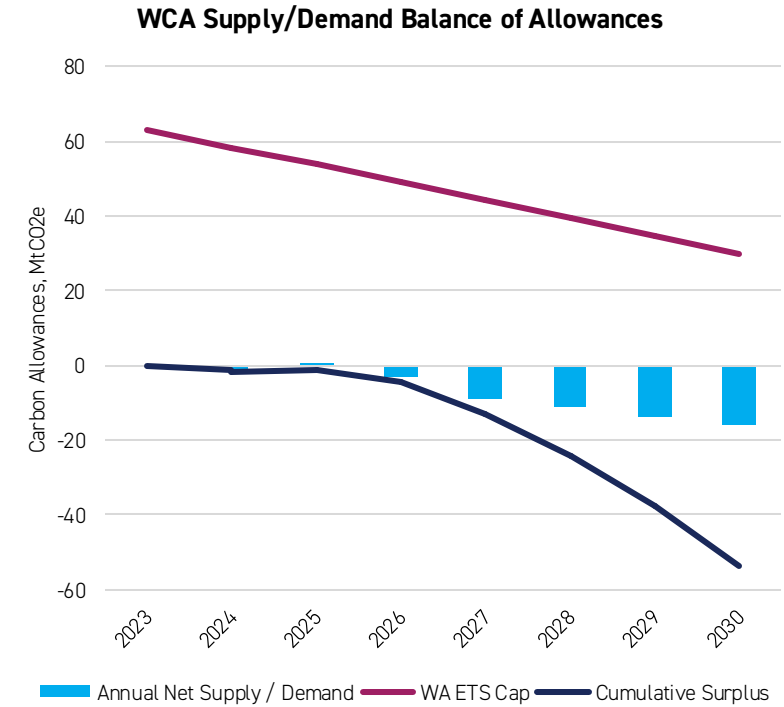
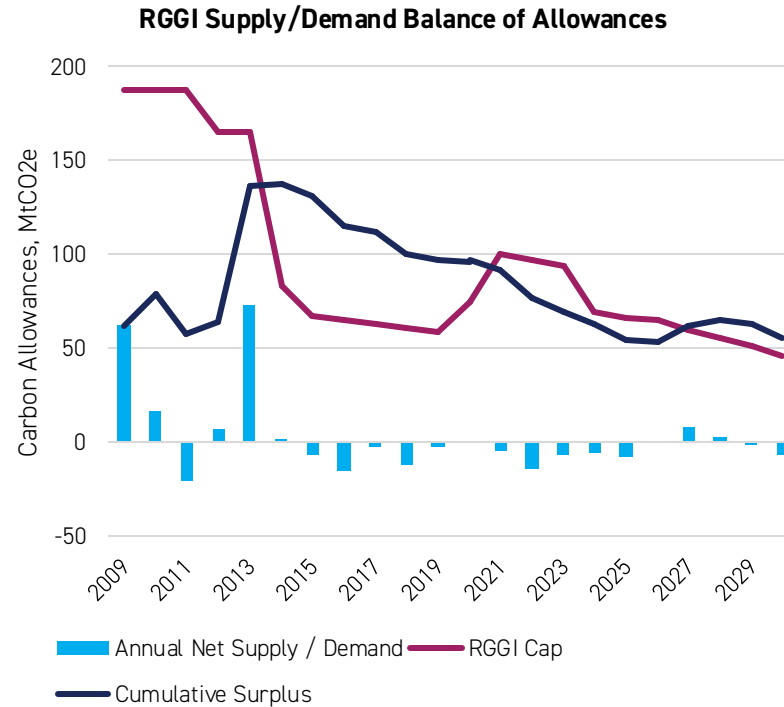
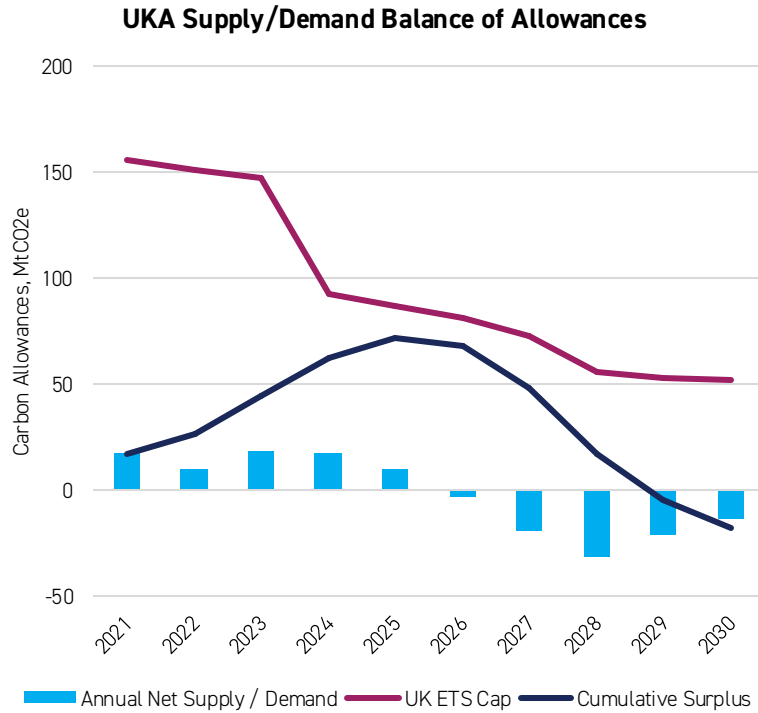
Source: Bloomberg New Energy Finance (BNEF), Sep 2024; Macquarie Insights, Jan 2025; cCarbon, "CARB's Nov'23 Workshop indicates CCAs to trade along the price ceiling at \$115 by 2030; high prices may push CARB to tread on a tightrope," 11/17/2023; California Air Resources Board (CARB), Cap-and-Trade Meetings and Workshops, Combined Presentation, retrieved 05/Jan/2024. Clear Blue forecasts retrieved 3/31/2025. Price targets are estimates from the sources indicated and do not indicate any actual investment.

# California Opportunity



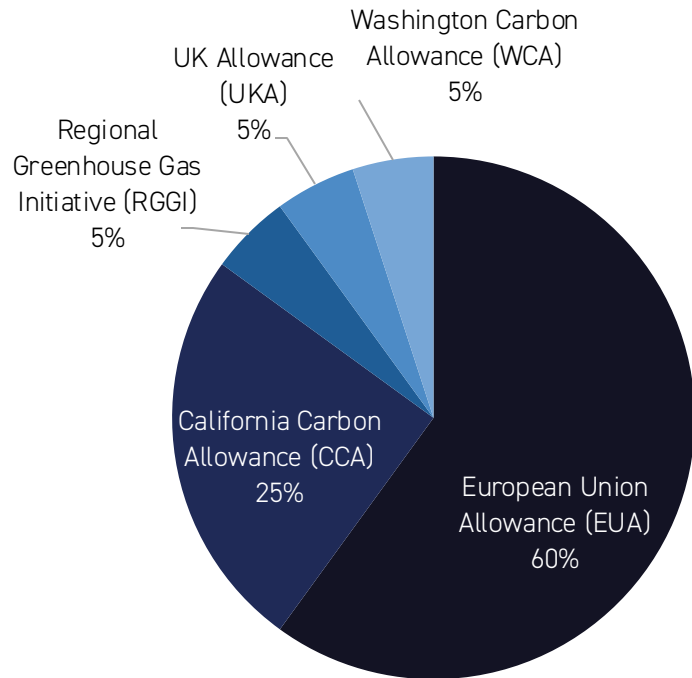
Data from Bloomberg and KraneShares analysis, as of 3/31/2025.

# Supply/Demand Modeling: United Kingdom, Northeast US Power (RGGI), Washington State



## Why carbon allowance futures? Liquidity and market size

**S&P Global Carbon Credit Index Weighting<sup>2</sup>**



**Carbon allowance futures markets annual trading volume and market growth<sup>1\*</sup>**

July 31, 2014 – December 31, 2024

Year	EUA volume (billions)	UKA volume (billions)	CCA volume (billions)	RGGI volume (billions)	WCA volume (billions)	Total volume	EUA YoY growth	UKA YoY growth	CCA YoY growth	RGGI YoY growth	WCA YoY growth	Total growth
2024	690.4	30.2	72.8	11.5	1.6	806.4	2%	6%	40%	104%		5%
2023	680.0	28.5	52.1	5.6		766.3	8%	-13%	17%	-3%		8%
2022	628.9	32.8	44.5	5.8		712.1	-4%	88%	1%	77%		-1%
2021	652.0	17.5	43.9	3.3		716.7	159%	-	108%	120%		161%
2020	251.8	-	21.1	1.5		274.4	23%	-	44%	10%		24%
2019	205.0	-	14.7	1.4		221.0	36%	-	116%	35%		39%
2018	150.8	-	6.8	1.0		158.6	354%	-	31%	81%		307%
2017	33.2	-	5.2	0.6		39.0	11%	-	56%	-57%		13%
2016	30.0	-	3.3	1.3		34.6	-31%	-	-12%	-1%		-28%
2015	43.2	-	3.8	1.3		48.2	-	-	-	-		-
2014	44	-	0.3	-		44.3	-	-	-	-		-

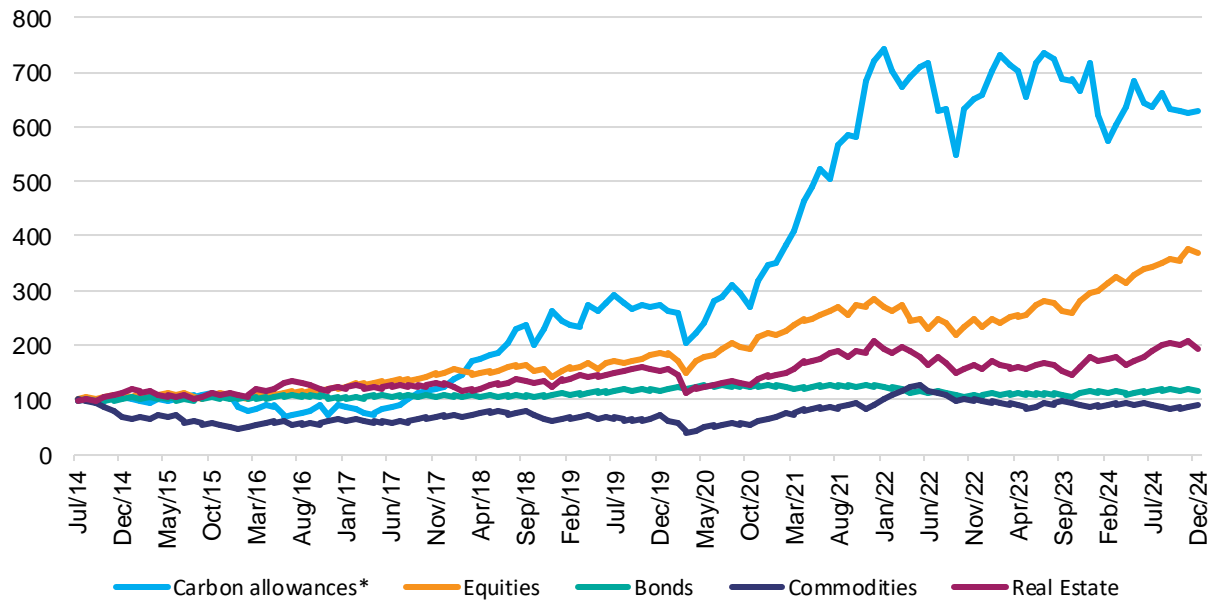
1. Data from Bloomberg as of 12/31/2024.

2. Data from S&P Dow Jones Indices. Weightings as of annual rebalance on 12/2/2024.

\*See end of presentation for definitions.

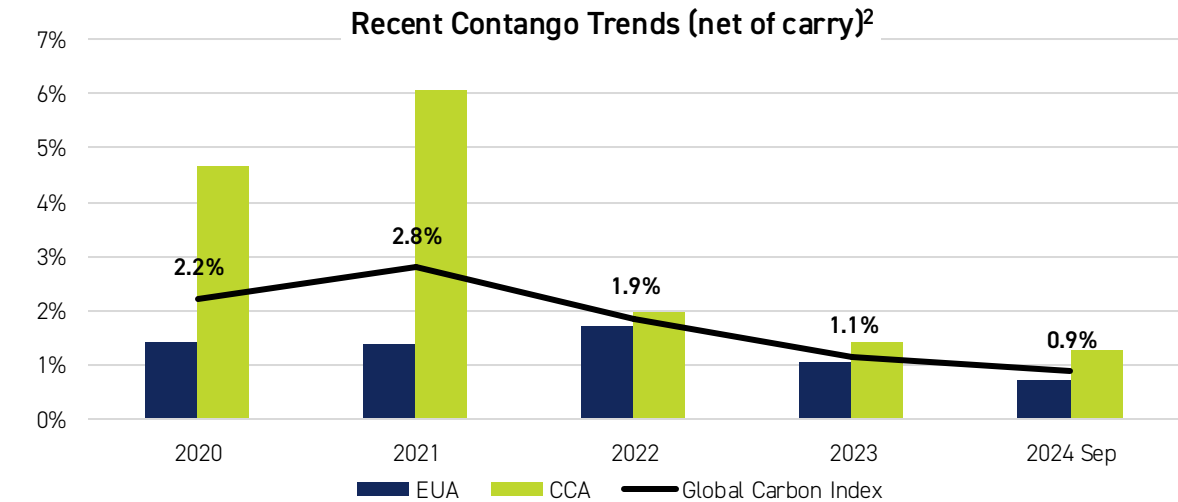
# Performance Comparison

Performance of carbon allowances versus major asset classes <sup>1</sup>					
Aug 31, 2014 – Mar 31, 2025					
	Carbon Allowances*	Equities	Bonds	Commodities	Real Estate
Annualized Return (%)	18.44%	12.53%	1.73%	-0.84%	6.44%
Annualized Volatility (%)	27.97%	15.10%	4.94%	21.84%	18.07%
Sharpe Ratio	0.68	0.74	0.01	-0.01	0.34



Correlation (Monthly) <sup>1</sup> Aug 31, 2014 – Mar 31, 2025						
Correlation	US Equities	Bonds	Commodities	Real Estate	Gold	Oil
Carbon Allowances*	0.296	0.055	0.294	0.239	-0.045	0.271

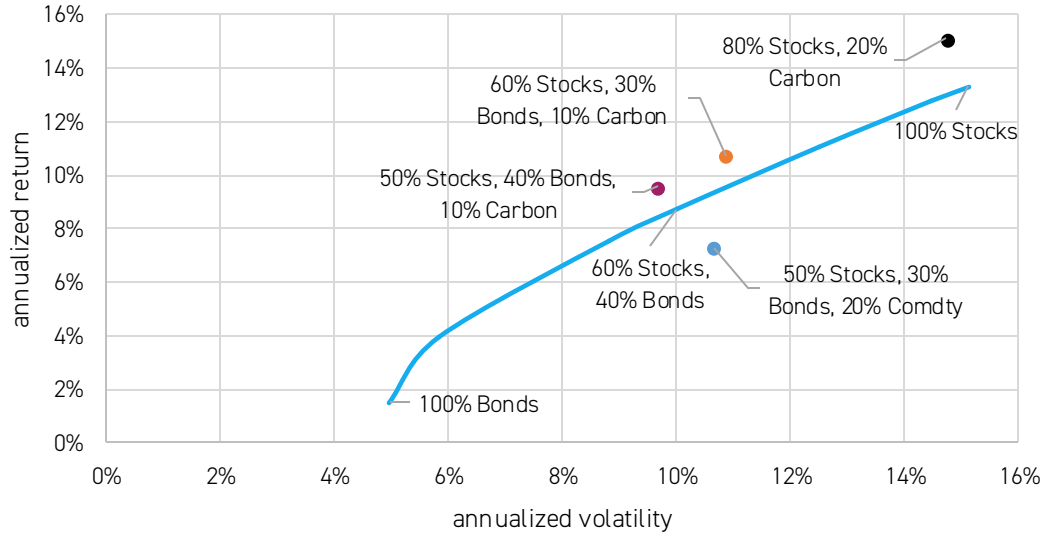
Correlation (Monthly) <sup>1</sup> Mar 31, 20250 Mar 31, 2025				
	EUA	CCA	RGGI	UKA
EUA	1			
CCA	0.140	1		
RGGI	0.119	-0.202	1	
UKA	0.588	-0.300	-0.110	1



1. Data from Bloomberg and S&P Indices as of 8/31/2014-3/31/2025.\*Carbon allowances: top four carbon allowance markets (weighted by volume) versus major asset classes. See end of presentation for material differences between asset types and definitions; Equities: S&P 500 ; Bonds: The Agg; Commodities: The S&P GSCI ; Real Estate: MSCI US REIT Index. Index returns are for illustrative purposes only and do not represent actual Fund performance. Index returns do not reflect any management fees, transaction costs or expenses. Indexes are unmanaged and one cannot invest directly in an index. Past performance does not guarantee future results. 2. Source: CLIFI and ICE as of 11/Sep/2024.

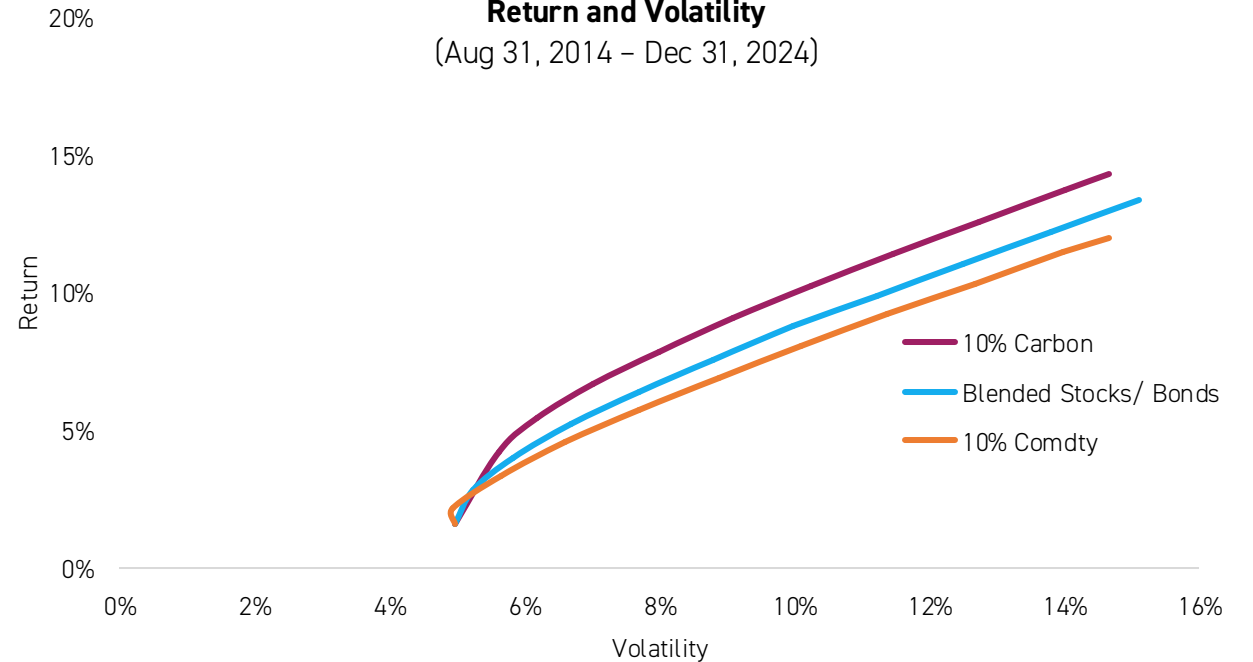
# Portfolio Impact

**KRBN Efficient Frontier**  
(Aug 31, 2014 – Dec 31, 2024)



## Allocating as little as 10% may yield risk-adjusted performance benefits

**Blended Portfolios**  
**Return and Volatility**  
(Aug 31, 2014 – Dec 31, 2024)



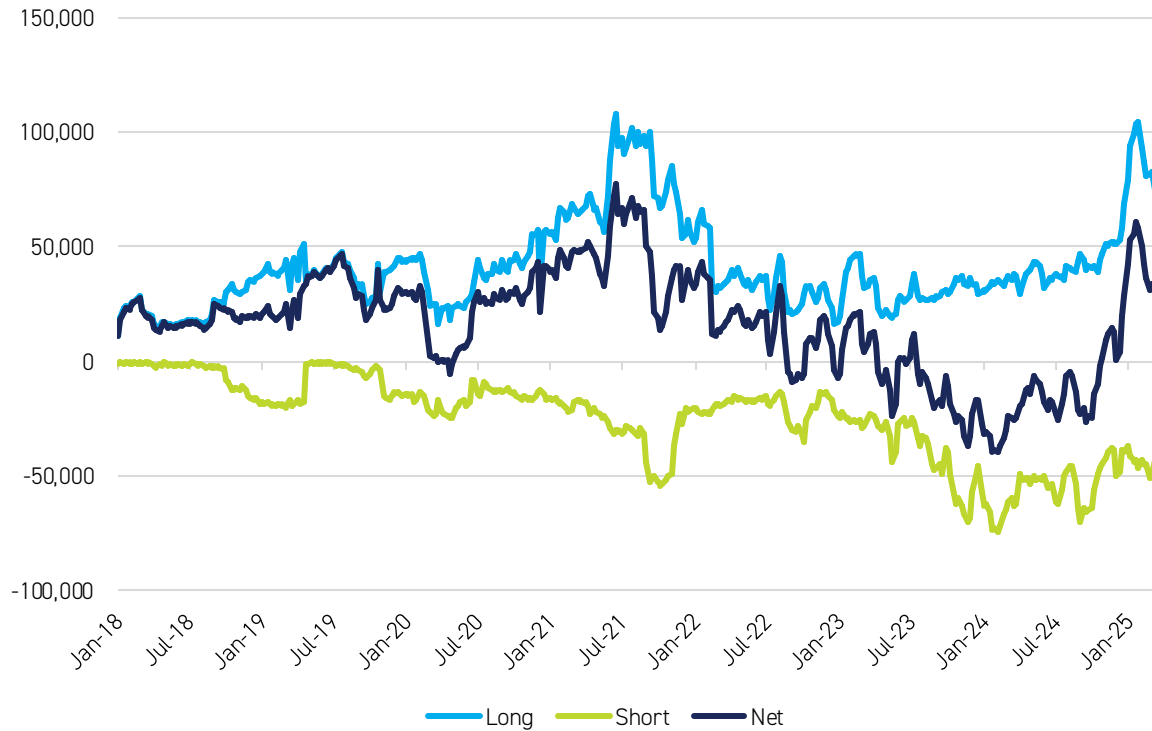
Portfolio Model	Annual Return	Volatility (Risk)	Sharpe Ratio
100% Bonds	1.51%	4.95%	-0.02
100% Stocks	13.32%	15.11%	0.80
100% Carbon	18.91%	28.01%	0.70
60% Stocks, 40% Bonds	8.71%	9.99%	0.72
60% Stocks, 30% Bonds, 10% Carbon	10.75%	10.86%	1.00
50% Stocks, 30% Bonds, 20% Commodities	7.27%	10.64%	0.71
80% Stocks, 20% Carbon	15.11%	14.73%	1.03

Data from Bloomberg and S&P Dow Jones Indices as of 12/31/2024. \*Carbon allowances: see end of presentation for material differences between asset types and definitions; Equities: S&P 500 ; Bonds: The Agg; Commodities: The S&P GSCI. Index returns are for illustrative purposes only and do not represent actual Fund performance. Index returns do not reflect any management fees, transaction costs or expenses. Indexes are unmanaged and one cannot invest directly in an index. The above chart is purely hypothetical and is not meant to inform any investment decision. Past performance does not guarantee future results.

## Investment Fund Positioning

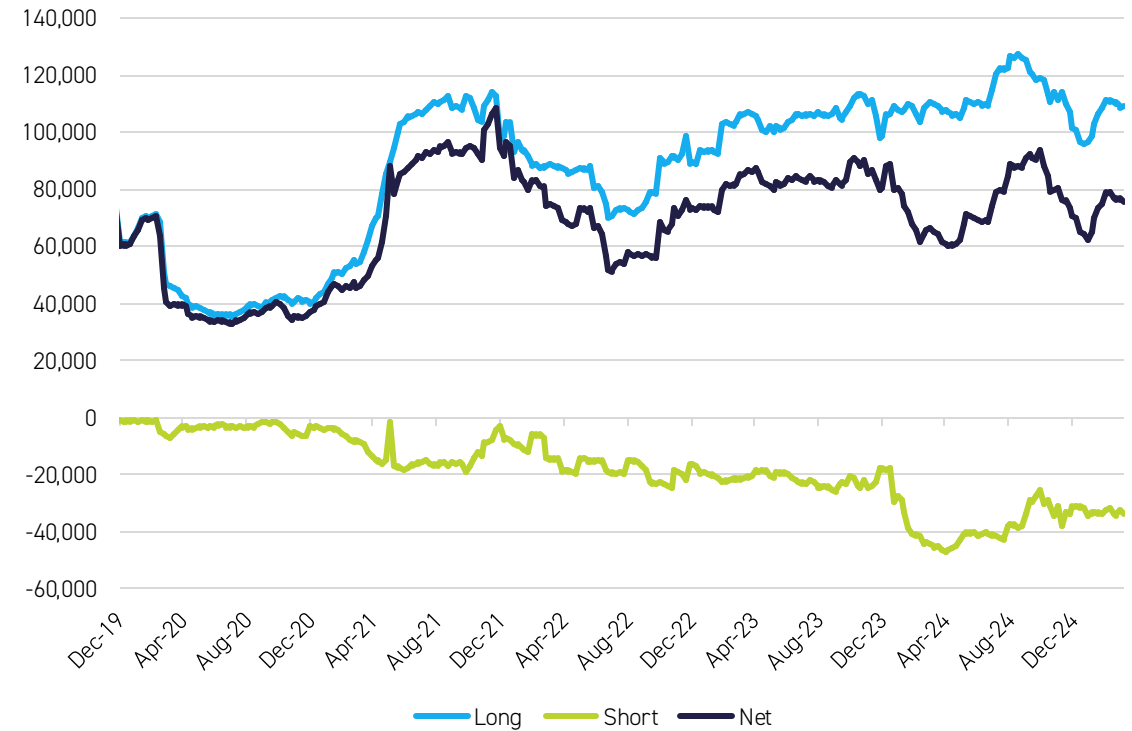
The historically high net negative positioning trend in EUAs among investment funds began earlier in 2023 but started to come off in Q4 2024 with fund positioning turning net positive signaling strong signs of supportive sentiment for the market.

Investment Funds EUA Positioning



Data from ICE as of 4/8/2025.

Managed Money CCA Positioning



Data from ICE as of 4/8/2025.

## KraneShares Global Carbon Strategy ETF (KRBN)

### Investment Strategy:

The KraneShares Global Carbon Strategy ETF (KRBN) is benchmarked to the S&P Global Carbon Credit Index, which offers broad coverage of cap-and-trade carbon allowances by tracking the most traded carbon credit futures contracts. The index introduces a new measure for hedging risk and going long the price of carbon while supporting responsible investing. Currently, the index covers the major European and North American cap-and-trade programs: European Union Allowances (EUA), California Carbon Allowances (CCA), the Regional Greenhouse Gas Initiative (RGGI), United Kingdom Allowances (UKA), and Washington State Carbon Allowances (WCA).

### KRBN Partner:

Climate Finance Partners serves as the sub-adviser of the Fund. Climate Finance Partners delivers innovative climate finance solutions and investment products to address capital needs for emerging environmental challenges. CLIFI is led by a team of investment professionals with deep experience in the fields of traditional investment and environmental finance.

Fund Details	Data as of 3/31/2025
Primary Exchange	NYSE
CUSIP	500767678
ISIN	US5007676787
Total Annual Fund Operating Expense	0.85%
Inception Date	07/29/2020
Distribution Frequency	Quarterly
Index Name	S&P Global Carbon Credit Index

### KRBN Performance History as of 3/31/2025:

	Cumulative %			Average Annualized %			
	3 Mo	6 Mo	Since Inception	1 Yr	3 Yr	5 Yr	Since Inception
Fund NAV	-3.65%	-3.65%	101.63%	-1.49%	-4.81%	-	16.19%
Closing Price	-3.72%	-3.72%	101.34%	-1.26%	-4.95%	-	16.15%
Index	-3.26%	-3.26%	111.20%	0.77%	-3.35%	-	17.35%

The performance data quoted represents past performance. Past performance does not guarantee future results. The investment return and principal value of an investment will fluctuate so that an investor's shares, when sold or redeemed, may be worth more or less than their original cost and current performance may be lower or higher than the performance quoted. For performance data current to the most recent month end, please visit [www.kraneshares.com/krbn](http://www.kraneshares.com/krbn).

Diversification does not ensure a profit or guarantee against a loss.

Index returns are for illustrative purposes only. Index performance returns do not reflect any management fees, transaction costs or expenses. Indexes are unmanaged and one cannot invest directly in an index.

## Holdings and Exposures of the KraneShares Global Carbon Strategy ETF (KRBN)

<b>Carbon Allowance Futures</b> as of 3/31/2025	<b>Identifier</b>	<b>Position</b>	<b>Exposure(\$)</b>	<b>% NAV</b>
European Union Allowance (EUA) 2025 Future	MOZ25 Comdty	1,317	96,710,408	56.18%
California Carbon Allowance (CCA) Vintage 2025 Future	BCYZ25 Comdty	981	30,204,990	17.55%
UK Allowance (UKA) 2025 Future	UKEZ5 Comdty	182	10,585,383	6.15%
Washington Carbon Allowance (WCA) Vintage 2025 Future	WKCZ25 Comdty	149	9,017,480	5.24%
Regional Greenhouse Gas Initiative (RGGI) Vintage 2025 Future	JELZ25 Comdty	376	8,896,160	5.17%
European Union Allowance (EUA) 2026 Future	MOZ26 Comdty	116	8,758,736	5.09%
California Carbon Allowance (CCA) Vintage 2026 Future	KBCZ26 Comdty	231	7,567,560	4.4%
			<b>171,740,717</b>	<b>100%</b>

<b>Collateral and Currency Management</b> as of 3/31/2025	<b>Identifier</b>	<b>Position</b>	<b>Exposure(\$)</b>	<b>% NAV</b>
KraneShares Sustainable Ultra Short Duration Index ETF	KCSH	4,698,500	117,673,933	68.36%
EURO	EUR	21,462,085	23,183,457	13.47%
USD Cash & Equivalents**	USD	20,580,873	20,580,873	11.96%
BRITISH STERLING POUND	GBP	5,625,000	7,260,500	4.22%
STATE ST INST US GOV	GVMXX	200,582	200,582	0.12%
			<b>168,899,345</b>	<b>98%</b>

Holdings, carbon allowance futures, and collateral are subject to change.

\*\*Includes USD cash deposits & cash in margin accounts (\$20,580,873)

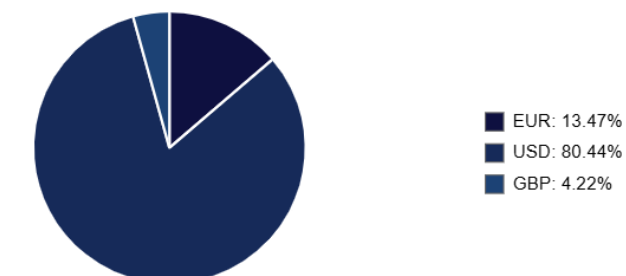
### Carbon Allowance Futures Breakdown

Data as of 3/31/2025



### Currency Exposure Breakdown

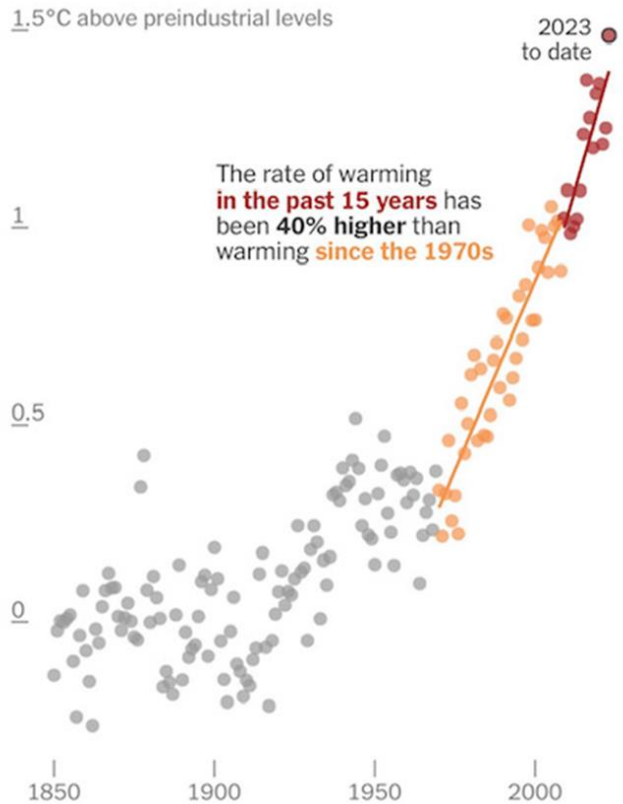
Data as of 3/31/2025



## The Problem

Global warming may have accelerated in the past 15 years

Annual average temperatures since 1850



Source: NY Times, "I Study Climate Change. The Data Is Telling Us Something New." Oct. 13, 2023.

## The Investment Solution

Economists forecast the largest capital cycle in history to address climate change.<sup>1</sup> To capture the investment opportunity, investors should consider being long the following three exposures:

### Carbon Allowances

KRBN

Global Carbon

KCCA

California Carbon

KEUA

EU Carbon

### Equities & Fixed Income

KSEA

Blue Economy

KCSH

Ultra Short Duration Bonds

KGRN

China Clean Tech

KARS

Electric Vehicles

1. McKinsey & Company, "The net-zero transition," January 2022

# Part II: Deep Dive into the Carbon Allowance Markets

## EU Emissions Trading System (ETS)

The EU ETS is the oldest emissions cap-and-trade program, first launched in 2005. It covers ~40% of the total EU emissions, including activities from the power sector, manufacturing industry, and aviation (including flights from the EU to the United Kingdom). In 2020, Switzerland linked with the EU ETS. Since inception, stationary installations have seen an emission reduction of around 43%.

### Market Outlook:

- A 55% cut in GHGs by 2030 vs. 1990 levels, rather than a 40% cut that was previously agreed
- Supply will continue to be reduced with an accelerated cap reduction factor of 4%, up from previous 2.2% while the Market Stability Reserve’s (MSR) 24% intake rate will remain
- REPowerEU—a €20 billion initiative that aims to speed up Europe’s transition away from Russian fossil fuels to low-carbon energy sources—will be funded partially from the frontloading of auction allowances. This approach introduces a supply of additional allowances now but results in a steeper tightening in the future
- Establishment of the Carbon Border Adjustment Mechanism (CBAM) puts tariff on goods imported into EU to account for carbon leakage. See case study at end of presentation for more details

EUA ETS Overview	
<b>Start of Operation</b>	2005
<b>Sector Coverage</b>	Domestic Aviation, Industry, Power
<b>Currency</b>	Euro
<b>Auction Frequency</b>	Weekly
<b>Cap</b>	1,325.6 MtCO <sub>2</sub> e
<b>Annual Cap Reduction</b>	4.3% in 2024, known as the Linear Reduction Factor (LRF) 4.4% starting in 2028
<b>TNAC</b>	1,111.7 MtCO <sub>2</sub> e
<b>Total revenue since start</b>	\$206.0 billion since 2013
<b>Governing Organization</b>	European Commission & relevant EU member state authorities
<b>Evaluation / ETS Review</b>	The European Commission publishes annual reports on the functioning of the European carbon market ( <a href="#">2021 report</a> ).
<b>GHG Reduction Targets</b>	BY 2030: At least 55% below 1990 GHG levels (Fit for 55 Proposal) BY 2050: Climate neutrality

\*TNAC: total number of allowances in circulation, determine how many additional allowances will be placed in the Market Stability Reserve (MSR) through reduced auctioning. TNAC as of 12/31/2023.

## EU Emissions Trading System (ETS)

### Market Stability Reserve (MSR)

- In 2019, EU introduced the MSR to address the current allowance surplus, and to improve the market's resilience to future shocks.
- The MSR will reduce auction volume by around 267 million allowances between September 2024 and August 2025.

Market Stability Reserve (MSR)		
<b>TNAC</b>	1,111.7 MtCO <sub>2</sub> e (2023)	Total number of allowances in circulation (TNAC). The Commission publishes the TNAC in June each year.
<b>Current Thresholds</b>	TNAC > 833 MtCO <sub>2</sub> e	24% (12% beyond 2023) of its volume is withdrawn from future auctions and placed into the reserve over a period of 12 months
	TNAC < 400 MtCO <sub>2</sub> e	100 million allowances are taken from the reserve and injected into the market through auctions
<b>Cancellation Provision</b>	400 MtCO <sub>2</sub> e	Maximum holding limit in MSR. The provision started in 2024 to remove excess allowances.

Note, Swiss allowance supply is not considered in the TNAC, and Swiss auction quotas are not affected by the MSR.

Source: International Carbon Action Partnership, "EU Emissions Trading System (EU ETS) Factsheet," retrieved 3/31/2025.

EU ETS Market Top Buyers		
Company name	Total Covered Emissions	% of Annual Cap
PGE GiEK S.A. Oddział Elektrownia Bełchatów	33,161,232	2.08%
Kraftwerk Neurath	22,075,757	1.38%
Kraftwerk Niederaußem	16,105,086	1.01%
Kraftwerk Jämschwalde	15,183,517	0.95%
Kraftwerk Weisweiler	14,490,397	0.91%
Kraftwerk Schwarze Pumpe	11,834,111	0.74%
ELEKTROWNIA KOZIENICE	11,593,312	0.73%
Kraftwerk Lippendorf	11,051,209	0.69%
PGE GiEK S.A. Oddział Elektrownia Opole	10,737,219	0.67%
PGE GiEK S.A. Oddział Elektrownia Turów	10,193,504	0.64%
Voestalpine Stahl Linz	9,399,356	0.59%
Kraftwerk Boxberg Werk IV	8,559,191	0.54%
Integriertes Hüttenwerk Duisburg	7,830,046	0.49%
ArcelorMittal France-Dunkerque	7,274,573	0.46%
Kraftwerk Boxberg Werk III	6,974,582	0.44%

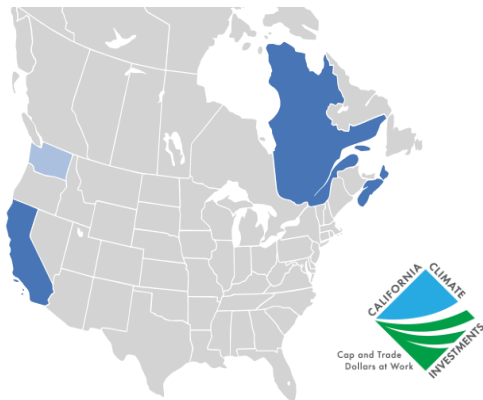
Source: euopea.eu, as of 8/31/2022.

## California Carbon Allowance Market (CCA)

The CCA market launched in 2012, and now covers ~75% of the state's GHG emissions. California joined the Western Climate Initiative (WCI) in 2007 and linked its program with Québec's in January 2014.

### Market Outlook:

- 2022 Scoping Plan increased the emissions reduction target to 48% below 1990 levels. Results in annual cap reduction factor rising to 9% from the current ~4%
- 2023 reserve price increased to \$24.04, up from \$22.21 while the ceiling price increased to \$88.22 from \$81.50. Implies 8.2% natural upside tailwind (increase of 5%+CPI) without changes in demand/supply
- Provides potential hedge against inflation through a price floor that is pegged to inflation rates, i.e., the **price floor rises 5% plus Consumer Price Index (CPI)**, see Case Study 1 slide for more details



CCA Overview	
<b>Start of Operation</b>	2012
<b>Sector Coverage</b>	Transport, Buildings, Industry, Power
<b>Currency</b>	US Dollar
<b>Auction Frequency</b>	Quarterly
<b>Cap</b>	317.71 MtCO <sub>2</sub> e
<b>Annual Cap Reduction</b>	Between 2021-2030, the cap declines by about 13.4 MtCO <sub>2</sub> e each year, averaging about 4% per year, to reach 200.5 MtCO <sub>2</sub> e in 2030
<b>TNAC*</b>	~300 MtCO <sub>2</sub> e
<b>Total Revenue Since Start</b>	\$27.0 billion
<b>Governing Organization</b>	California Air Resources Board (CARB)
<b>Evaluation / ETS Review</b>	CARB is required to update their "California Climate Change Scoping Plan" at least every five years and provide annual reports to committees of the legislature and the board
<b>GHG Reduction Targets</b>	By 2030: 40% reduction from 1990 GHG levels By 2045: Achieve carbon neutrality

\*TNAC: total number of allowances in circulation, a term specific to the EU ETS but is a measure of the allowance surplus. TNAC as of 3/31/2025.

International Carbon Action Partnership, "USA - California Cap-and-Trade Program Factsheet," retrieved 3/31/2025.

## California Carbon Allowance Market (CCA)

CCA Market Stability Mechanism (2025)		
<b>Auction Reserve Price (Floor Price)</b>	\$25.87 per allowance	The auction reserve price increases annually by 5% plus inflation, as measured by the Consumer Price Index.
<b>Allowance Price Containment Reserve (APCR)</b>	Allowances from each annual cap are placed in the APCR, where they are distributed into two price tiers and a price ceiling. Two-thirds of the allowances are distributed evenly across the two price tiers with the remaining third, plus unsold allowances that have been transferred into the APCR, placed into the price ceiling.	
<b>Cost Containment Reserve</b>	Tier 1: \$60.47 (66,811,000 credits)	Tier prices increase by 5% plus inflation (as measured by the Consumer Price Index)
	Tier 2: \$77.70 (89,537,000 credits)	It allows covered entities access to allowances at set prices as a hedge against higher costs.
<b>Price Ceiling</b>	\$94.92	At the price ceiling, a compliance entity can purchase CCAs (or, if no allowances remain, "price ceiling units") up to the amount of its current unfulfilled emissions obligation.  The revenues from the sale of price ceiling units will be used to purchase additional emissions reductions on a ton for ton basis. Price ceiling sales only occur when no allowances remain at the two lower tiers and an entity cannot meet its obligation with its existing account.

CCA Market Top Buyers		
Company name	Total Covered Emissions	% of Annual Cap
Chevron U.S.A., Inc.	12,339,195	4.09%
MARATHON PETROLEUM COMPANY, LP	10,859,257	3.60%
Southern California Gas Company	6,437,755	2.14%
Phillips 66 Company	5,643,777	1.87%
Pacific Gas and Electric Company	5,580,448	1.85%
PBF Energy Western Region, LLC	4,984,949	1.65%
Valero Marketing and Supply Company	3,603,171	1.20%
Shell Energy North America (US), LP	2,603,064	0.86%
Calpine Energy Services, LP	2,273,012	0.75%
BP Products North America, Inc.	2,171,380	0.72%

Source: CARB, as of 8/31/2022.

## United Kingdom ETS

The UK ETS began operating as a stand-alone program in January 2021, prior to that it was part of the EU ETS since 2005. The market's design is similar to that of the current EU ETS. The program covers energy-intensive industries, the power sector, and aviation within the UK and European Economic Area (EEA0). Collectively, the program represents roughly one-third of total UK emissions.

### Market Outlook:

- Regulators are considering reducing the cap to align with the UK's net zero target, supporting market prices
- To achieve the UK's aggressive targets, UKA prices will need to rise to higher levels to incentivize abatement, which should ensure strong policy support for the program.



UK ETS Overview	
<b>Start of Operation</b>	2021
<b>Sector Coverage</b>	Domestic Aviation, Industry, Power
<b>Currency</b>	British Pound
<b>Auction Frequency</b>	Every 2 Weeks
<b>Cap</b>	86.7 MtCO <sub>2</sub> e
<b>Annual Cap Reduction</b>	Aligned with net zero
<b>TNAC</b>	107.8 MtCO <sub>2</sub> e (2023)
<b>Total Revenue Since Start</b>	\$18.7B
<b>Governing Organization</b>	UK states 'government, environmental, and transport bodies
<b>Evaluation / ETS Review</b>	Two mandatory whole-system reviews under Phase 1: the first by 2023 and second by 2028 with program changes expected to be implemented by 2026 and 2031, respectively.
<b>GHG Reduction Targets</b>	BY 2030: At least a 68% reduction in UK net GHG emissions from 1990 levels BY 2035: Limit UK net GHG emissions to 965 MtCO <sub>2</sub> e over 2033-37 BY 2050: Net-zero UK GHG emissions

## United Kingdom ETS

### UK ETS Market Stability Mechanism (2025)

<b>Transitional Auction Reserve Price (ARP)</b>	<p>£22 (\$24.17)</p> <p>No further changes to the level of the ARP are planned before it is likely withdrawn as the UK ETS matures</p>
<b>Supply Adjustment Mechanism (SAM)</b>	<ul style="list-style-type: none"> <li>• Not yet implemented but expected to be established in the future</li> <li>• Will be broadly based on the EU ETS Market Stability Reserve (MSR)</li> <li>• Currently, the transitional ARP helps ensure minimum price continuity</li> </ul>
<b>Cost Containment Mechanism (CCM)</b>	<ul style="list-style-type: none"> <li>• Designed to avoid spikes in allowance prices by auctioning additional allowances. If the CCM is triggered, regulators can decide if and how to intervene</li> <li>• Intervention includes: redistributing allowances between the current year's auctions; bringing forward allowances from future years; drawing from the Market Stability Mechanism Account; or the auctioning of up to 25% of remaining allowances in the NER</li> </ul> <p><b>Triggers</b></p> <ul style="list-style-type: none"> <li>• 2021: CCM is triggered if, for three consecutive months, the UK ETS carbon price is double the 2-year average allowance price</li> <li>• 2022: CCM is triggered if, for three consecutive months, the UK ETS carbon price is 2.5 times the 2-year average allowance price</li> </ul>

### UK ETS Market Top Buyers

Company name	Total Covered Emissions	% of Annual Cap
Port Talbot Steelworks	6,643,839	4.39%
Pembroke Power Station	4,993,364	3.30%
Scunthorpe Integrated Iron & Steel Works	4,679,901	3.09%
Ratcliffe on Soar Power Station	3,633,660	2.40%
Staythorpe Power Station	3,011,979	1.99%
VPI Immingham	2,742,865	1.81%
Saltend Cogeneration Company Limited	2,729,311	1.80%
Didcot B Power Station	2,502,719	1.65%
Esso Petroleum Company Limited	2,363,983	1.56%
Grain CCGT-CHP Station	2,239,895	1.48%

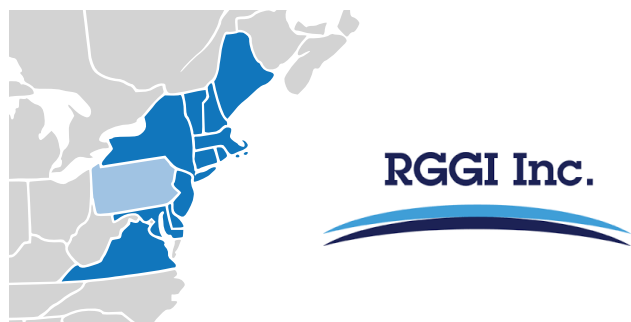
## Regional Greenhouse Gas Initiative (RGGI)

RGGI, the first mandatory GHG emissions trading system (ETS) in the United States, currently consists of eleven states along the Northeastern U.S. The system started operating in 2009 with ten states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont). Virginia then joined in 2021. RGGI covers emissions from the power sector.

To date, RGGI has undergone two review processes that have led to tighter caps and design adjustments; its third program evaluation is currently under review. Going forward, the RGGI cap will reduce by 30% compared to 2020 levels over 2021-2030. Since its inception, RGGI emissions have reduced by more than 50%, which is twice that of the national rate, and raised over \$4 billion in revenue to invest in local communities.

### Market Outlook:

- The RGGI third program review should result in a tightening of supply, supporting upward price pressure
- Emission budget is expected to tighten by 17% between 2026-2030
- Potential expansion of the RGGI market into new states is also bullish for prices



RGGI Overview	
<b>Start of Operation</b>	2009
<b>Sector Coverage</b>	Power
<b>Currency</b>	US Dollar
<b>Auction Frequency</b>	Quarterly
<b>Cap</b>	66.59 MtCO <sub>2</sub>
<b>Annual Cap Reduction</b>	~3% of the 2020 cap between 2021 and 2030
<b>TNAC</b>	-
<b>Total Revenue Since Start</b>	\$7.2 billion
<b>Governing Organization</b>	Statutory and/or regulatory authority of each RGGI state and Environmental and energy agencies for each RGGI state
<b>Evaluation / ETS Review</b>	2012 Model Rule 2017 Model Rule Third review expected to conclude in 2024
<b>GHG Reduction Targets</b>	By 2030: 30% cut in power sector emissions compared to the 2020 CO <sub>2</sub> emissions cap (2017 Model Rule)

## RGGI Market Design

### RGGI Market Stability Mechanism (2025)

<b>Auction Price Floor</b>	\$23.20 per short ton, increasing by 2.5% per year (to reflect inflation).
<b>Cost Containment Reserve (CCR)</b>	<ul style="list-style-type: none"> <li>Since 2014, RGGI operates with a CCR, which consists of a quantity of allowances in addition to the cap which are held in reserve and only released to the market when certain trigger prices are reached.</li> <li>Beginning in 2021, allowances provided within the CCR will be equal to 10% of the regional cap.</li> <li><b>The trigger price is \$17.03, increasing by 7% per year thereafter.</b> It had previously increased by 2.5% per year starting from \$10 between 2017 and 2020.</li> <li>The CCR was triggered in 2014 and 2015, where all 15 million allowances were sold from the CCR. At the last quarterly auction of 2021, the CCR was also triggered, where 3.9 million of the available 11.9 million allowances were sold.</li> </ul>
<b>Emissions Containment Reserve (ECR)</b>	<ul style="list-style-type: none"> <li>In 2021, RGGI implemented an ECR, where allowances are withheld from auction if certain trigger prices are reached, up to an annual withholding limit of 10% of the emission budgets (i.e., the share of each state in the regional cap) of participating states. Allowances withheld will not be re-offered for sale, effectively adjusting the cap downward.</li> <li><b>The trigger price is \$7.86, increasing by 7% per year thereafter</b></li> <li>Note, Maine and New Hampshire do not participate in the ECR.</li> </ul>

### RGGI Market Top Buyers

Company name	Total Covered Emissions	% of Annual Cap
Brandon Shores	9,596,143	10.90%
Astoria Energy	7,969,166	9.06%
Lake Road Generating Company	6,941,834	7.89%
East River	6,397,403	7.27%
Independence	6,134,584	6.97%
Bethlehem Energy Center (Albany)	6,020,815	6.84%
Morgantown	5,813,118	6.61%
CPV St. Charles Energy Center	5,100,162	5.80%
Northport	5,037,301	5.72%
CPV Towantic Energy Center	4,908,313	5.58%

Source: RGGI Inc., as of 8/31/2022.

## Washington State Carbon Allowance (WCA) Market

- WCA market started with a very tight (balanced) supply/demand, which is one of the main reasons why WCA prices tended to be higher than CCAs.
- Due to high demand and projected deficits, it is expected that APCR reserve will be fully depleted each year through the end of the first compliance phase (2023-2026). This may lead to prices rising above Tier 1 level and be somewhere between Tier 1 and Price Ceiling within the next few years, potentially as early as 2026 level
- Earliest possible linkage with California/WCI is likely 2027

### WCA Market Stability Mechanism (2025)

<b>Auction Floor Price</b>	\$25.85 per allowance	The auction reserve price increases annually by 5% plus inflation, as measured by the Consumer Price Index.
<b>Allowance Price Containment Reserve (APCR)</b>	The APCR serves as 'speed bumps' to prevent prices from rising too quickly, consisting of two pre-defined [tier] price levels that release additional allowances if reached. The APCR was frontloaded, with 5% of the caps in the first and second compliance periods (2023-2030) set aside at the outset of the program.	
	Tier 1: \$60.43 Tier 2: \$77.63	Tier prices increase by 5% plus inflation (as measured by the Consumer Price Index) It allows covered entities access to allowances at set prices as a hedge against higher costs.
<b>Price Ceiling</b>	\$94.85	If there are no units remaining in the APCR, price ceiling units are made available to covered entities. Price unit sales only occur following the request of a covered entity, which must be at least ten days before the compliance deadline.

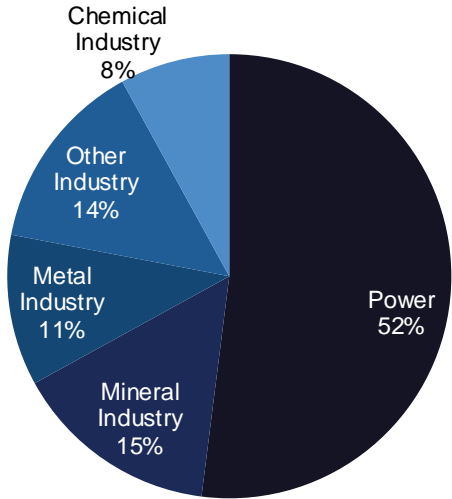
Source: International Carbon Action Partnership, "USA - Washington Cap-and-invest Program," retrieved 3/31/2025.

### WCA Overview

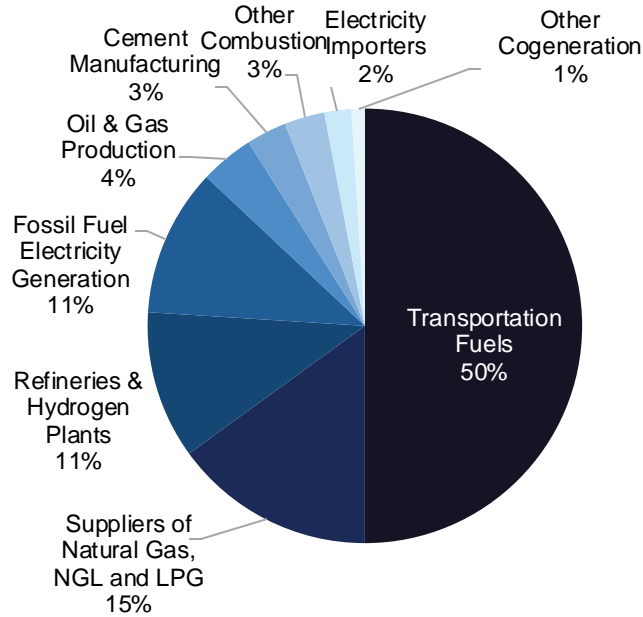
<b>Start of Operation</b>	2023
<b>Sector Coverage</b>	Transport, Buildings, Industry, Power
<b>Currency</b>	US Dollar
<b>Auction Frequency</b>	Quarterly
<b>Cap</b>	53.8MtCO2 (2025)
<b>Annual Cap Reduction</b>	7% (2023-2026)
<b>TNAC</b>	-
<b>Verified Emissions</b>	-
<b>Total Revenue Since Start</b>	\$2 billion
<b>Governing Organization</b>	Department of Ecology, Western Climate Initiative (WCI)
<b>Evaluation / ETS Review</b>	Starting Dec 2027, and every four years afterwards, the Department of Ecology is required to submit a comprehensive review of the program to the legislature
<b>GHG Reduction Targets</b>	By 2030: 45% reduction from 1990 GHG levels By 2040: 70% reduction from 1990 GHG levels
<b>Offset Use</b>	Max 5% of an entity's compliance obligation from projects not located on federally recognized tribal land; an additional 3% can be met from projects located on federally recognized tribal land

# Breakdown of Emissions by Sectors Covered Under the Cap-and-Trade Programs

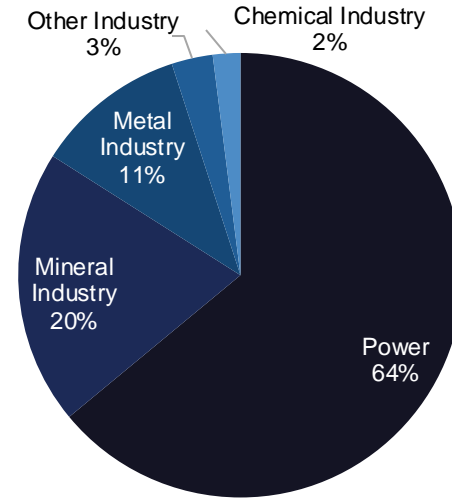
EU Emissions



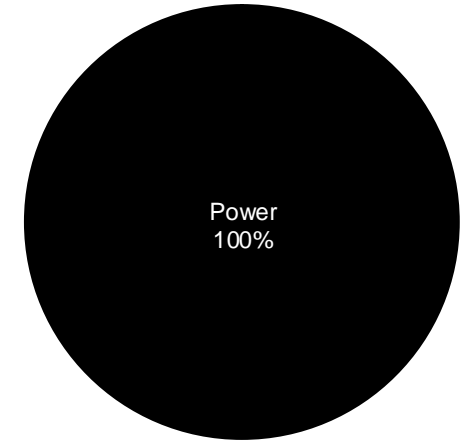
CCA Emissions



UK Emissions



RGGI Emissions



Source: cCarbon as of 12/31/2021

## Carbon Border Adjustment Mechanism (CBAM) expands carbon pricing to international trade

- CBAM acts as a tariff on foreign companies by requiring energy-intensive producers to pay the EUA price on goods imported into the region to **establish a more level playing field across borders. The gradual introduction of the CBAM is aligned with the phase-out of free allowances.**
- **It will also indirectly bring more foreign companies into the program** as they could potentially hedge the tariffs in the EUA market, creating greater price discovery dynamics.
- It **doubly raises revenues** through both importers paying the new tariff and EU industrials paying for previously free allowances.

### Before CBAM

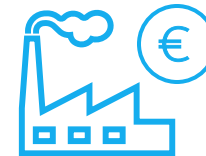


EU gave companies an adjusted discount (share of free allowances) to keep them competitive with non-EU companies

### After CBAM Implementation



Remove free pass and introduce tariff on imports indexed to the weekly price of EUAs



Deductions are allowed if importer can prove that carbon price was already paid in production process



**CBAM Certificate**

80% holding requirement for YTD emissions at the end of each quarter

Cannot be banked indefinitely or traded

Transitional Phase started in October 2023; Stage 1 goes into effect in January 2026

**Stage 1 high-risk carbon leakage sectors covered:** cement, iron & steel, aluminum, fertilizers, electricity, and hydrogen

## CBAM coverage may increase from 5% of global exports in the initial stage to 31% by 2030

Stages of CBAM Coverage:		
	Sectors	Free Allowance Phase-out
<b>Stage 1</b> (2026)	<b>Carbon Intensive &amp; High Risk of Carbon Leakage:</b> Cement, iron and steel, aluminum, fertilizers, electricity, hydrogen	Proportion of free allowances declines at a rate of 2.5% in 2026 to 100% (no free allowances) by 2030
<b>Stage 2</b> (2026-2030)	<b>Max. Carbon Leakage Coverage:</b> Chemicals, plastics, rubber, glassware	Currently no phase-out but will set a new benchmark calculating allocations for 2026-30
<b>Stage 3</b> (Post-2030)	<b>Finished goods (All Imports):</b> Machinery, autos + Required reporting and taxation of upstream Scope 3 emissions	Likely see full phase-out of free allowances by 2030, prior CBAM inclusion

### Free Allocation Process:

- The free allocation for each compliance entity is calculated based on product specific benchmarks, which reflect the average emissions of the top performing 10% of entities within their respective subsectors
- Roughly 43% of EUAs are provided for free each year, 51% are auctioned, and the remaining are placed in the market stability reserves and buffers

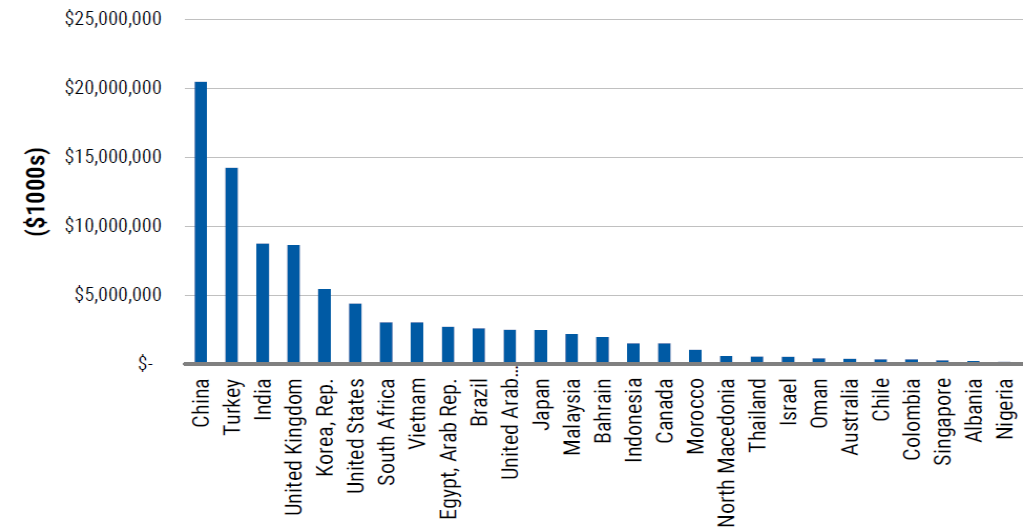
Timeline for Stage 1 Phase-out of Free EUA Allocations:								
2026	2027	2028	2029	2030	2031	2032	2033	2034
2.5%	5%	10%	22.5%	48.5%	61%	73.5%	86%	100%

## CBAM Impact: Most exposed sectors and trading partners

- Over 119Mt of CBAM-covered products were exported to the EU in 2022, with the iron & steel industry representing nearly two-thirds of the total
- Most exposed: Albania, Armenia, North Macedonia, the UK, Egypt, and Turkey exported more than 50% of their covered goods to the EU
- China is most exposed to CBAM on a nominal basis, with \$21 billion of CBAM-covered goods sent to the EU in 2022
- The top five CBAM trade partners have or plan to have domestic carbon pricing programs by 2026

% of its WTO Trade of the Product to the EU27												
	China	Turkey	India	UK	Korea	USA	S. Africa	Vietnam	Egypt, Arab Rep.	Brazil	UAE	Japan
Aluminum	15%	75%	27%	72%	10%	8%	36%	11%	78%	6%	24%	8%
Cement	3%	19%	7%	47%	0%	19%	0%	1%	3%	40%	0%	1%
Fertilizer	3%	63%	1%	67%	1%	10%	1%	3%	63%	12%	1%	3%
Hydrogen	0%	86%	0%	87%	3%	1%	0%			0%	0%	0%
Iron & Steel	10%	49%	29%	64%	13%	8%	20%	24%	56%	13%	10%	6%
<b>Average</b>	<b>6%</b>	<b>59%</b>	<b>13%</b>	<b>67%</b>	<b>5%</b>	<b>9%</b>	<b>11%</b>	<b>10%</b>	<b>50%</b>	<b>14%</b>	<b>7%</b>	<b>4%</b>

Total value of all CBAM covered goods to the EU27 totaled \$90 billion in 2022



## REPowerEU allowance auctioning creates short term added supply but is offset after 2026

### Policy response to the Russian invasion of Ukraine



## REPowerEU

Phase out Russian fossil fuel dependency

+

Increase Europe's renewable capacity



Accelerate Clean  
Energy Transition



Save Energy



Diversify Energy  
Sources

### €20B initiative funded from frontloading EUAs & Innovation Fund

- 40% will be from frontloaded allowances from auctions in 2023-26, meaning allowances set aside for future auctions will be sold earlier
- 60% will come from the Innovation Fund, which finances projects developing innovative, emissions reduction technologies.

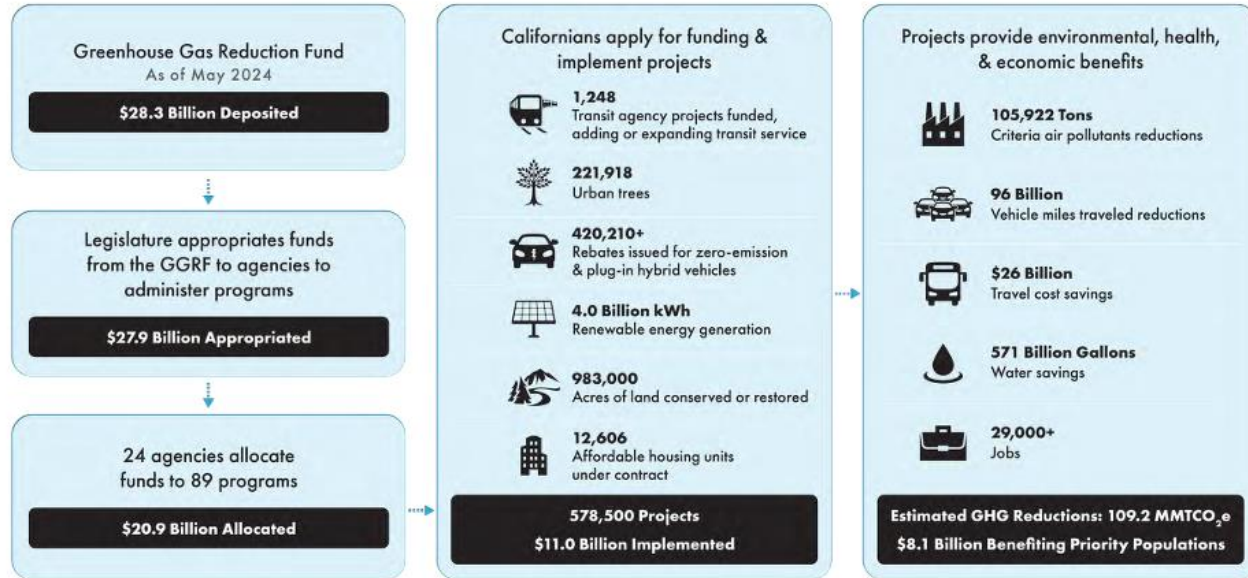
## Case Study: Auction Revenue Use in California

- California has implemented nearly 600,000 climate/development projects worth \$9.3 billion since the start of the program. Roughly 76% of funding is directed toward low-income communities.
- Revenue generated at auctions is returned to utility ratepayers through the California Climate Credit and funds the Greenhouse Gas Reduction Fund and the California Climate Investments program, which support investments in energy efficiency, clean transportation, solar energy, and other GHG-reducing projects.
- For an interactive map of climate investments statewide, visit <https://webmaps.arb.ca.gov/ccimap/>.

*“This is the backbone of our climate funding in this state...It’s a point of deep pride that we continue to be a model for the rest of the nation, and for that matter, around the world.”*  
 –Governor Gavin Newsom

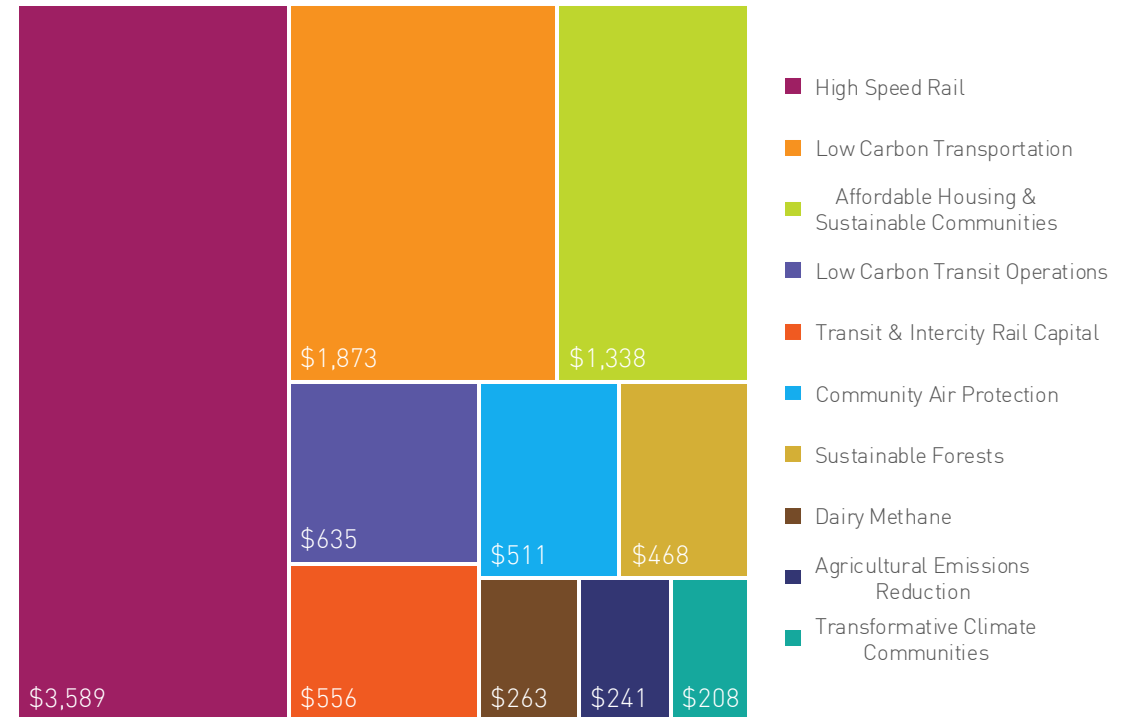
### CALIFORNIA'S CAP-AND-TRADE DOLLARS AT WORK

As of November 2023



Source: CA Climate Investments, "2024 Annual Report, Cap and Trade Proceeds."

**Total Implemented Investments from the Greenhouse Gas Reduction Fund**  
 (Top 10 Funded Project Categories, in millions USD)



Source: CA Climate Investments and Berkley Law as of November 2022.

## Case Study: Beyond 2030, CCA plays a crucial role in achieving new tightened emissions targets

- Though the cap-and-trade program does not technically expire until 2050, CARB's authority to actively operate and revise the program beyond 2030 will likely require a new legislative initiative.
- While there has been some uncertainty surrounding the extension of the CCA program, below are key reasons supporting the carbon market beyond 2030.

### Market caps set to 2050

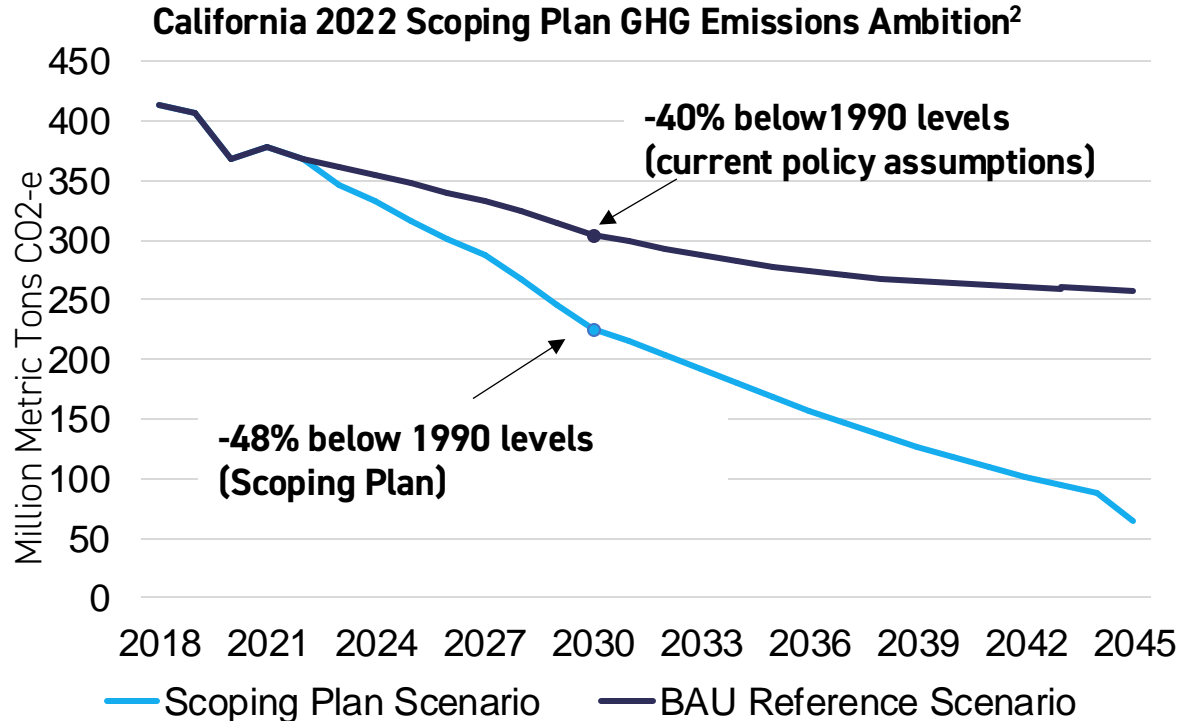
CCA program regulation includes specific annual market caps through 2031, with a predetermined formula to set annual caps from 2032-2050.<sup>1</sup>

### Room to contribute to 2045 carbon neutrality goals

The emissions in 2030 are expected to be ~200Mt with the Scoping Plan's new emissions reduction target, while the Reference scenario (no policy change) projects them to be ~300Mt.<sup>2</sup>

### CCAs can be auctioned years in advance

According to law firm, Sheppard Mullin, the program would have to end several years before 2030 to prevent the loss of value from CCAs auctioned in advance. The lawyers argue this risk highlights how the current provision's 2030 date is 'meaningless'.<sup>3</sup>



1. CARB, "Unofficial electronic version of the Regulation for the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms," p. 110, April 2019.  
 2. CARB, CLIFI as of 2/28/2023.  
 3. Carbon Pulse, "California's ARB has authority to operate cap-and-trade program beyond 2030 -law firm," October 26, 2022

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By Oktay Kurbanov, Partner at Climate Finance Partners (CLIFI)



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## KRBN Disclosures

Potential Risk	Description
<b>Loss of principal</b>	There are risks involved with investing, including possible loss of principal. There is no guarantee the Fund will achieve its investment objectives.
<b>Futures Market / Cap and Trade</b>	The Fund invests in futures tied to cap and trade markets. There is no assurance that cap and trade regimes will continue to exist. Regulatory changes may affect cap and trade with adverse impacts on the Fund. Funds may underperform other similar funds that do not consider conscious company / ESG guidelines when making investment decisions.
<b>International</b>	The Fund invests internationally. In addition to the normal risks associated with investing, international investments may involve risk of capital loss from unfavorable fluctuations in currency values from differences in generally accepted accounting principles or from social, economic or political instability in other nations.
<b>Derivatives / Fixed Income</b>	The Fund invests in derivatives and fixed income instruments. The primary risk of derivative instruments is that changes in the market value of securities held by the Fund and of the derivative instruments relating to those securities may not be proportionate. Derivatives are also subject to illiquidity and counterparty risk. Fixed Income securities are subject to interest rate risk and will decline in value as interest rates rise.
<b>Subsidiary</b>	The Fund invests through a subsidiary. The subsidiary is organized in the Cayman Islands, and is not registered with the SEC under the Investment Company Act of 1940, The Fund will not receive all the protections offered shareholders of registered investment companies.
<b>Clearing broker</b>	The Fund's investment in exchange-traded futures contracts may expose the Fund to risks of a clearing broker. This broker maintains assets in a bulk segregated account. Fund assets deposited with this broker to serve as margin may be used to satisfy the broker's own obligations. In event of default, the Fund could experience lengthy delays in recovering some or all its assets or may not see any recovery.
<b>Not Diversified</b>	The Fund is not diversified.

## Major asset classes material differences from carbon allowances

Investment	Material Differences
<b>Carbon Allowance Futures Contracts</b>	Carbon futures contracts are deliverable contracts where each Clearing Member with a position open at cessation of trading for a contract month is obliged to make or take delivery of Carbon Emission Allowances to or from the regional regulatory body in accordance with the ICE Futures Regulations. Specific risks are discussed on the disclosure slides at the end of the presentation.
<b>Equities</b>	The risks of investing in equity include share price falls, receiving no dividends or receiving dividends lower in value than expected. They also include the risk that a company restructure may make it less profitable. Alternatively a company may fail. If this happens, you may be at the end of a long list of creditors and therefore risk not get the value of your investment back.
<b>Bonds</b>	Bonds are subject to interest rate risk and will decline in value as interest rates rise. Other risks include, but are not limited to reinvestment, inflation, credit/default, ratings downgrades, and liquidity risks.
<b>Commodities</b>	Investments in commodities are subject to higher volatility than more traditional investments. Commodity price risk is the possibility that commodity price changes will cause financial losses for the buyers or producers of a commodity.
<b>Real Estate (REITs)</b>	In addition to the normal risks associated with investing, REIT investments are subject to changes in economic conditions, credit risk and interest rate fluctuations.

## About KraneShares and Partners for the first global carbon ETF (KRBN)



### About KraneShares

KraneShares is a specialist investment manager focused on China, Carbon, Climate, and other uncorrelated assets. KraneShares seeks to provide innovative, high conviction, and first to market strategies. The firm was founded in 2013 and manages for institutions and individuals globally. In 2017, KraneShares formed a strategic partnership with China International Capital Corporation (CICC) when they acquired a majority ownership stake. The firm is a signatory of the United Nations-supported Principles for Responsible Investing (UN PRI).

### About Climate Finance Partners

KRBN is sub-advised by Climate Finance Partners (CLIFI). CLIFI delivers innovative climate finance solutions and investment products to address capital needs for emerging environmental challenges. CLIFI is led by a team of investment professionals with deep experience in the fields of traditional investment and environmental finance.



## Index Definitions

**S&P 500:** Standard & Poor's Index is a capitalization-weighted index of 500 stocks.

**Bloomberg Barclays US Aggregate Bond Index ("The Agg"):** A broad base, market capitalization-weighted bond market index representing intermediate term investment grade bonds traded in the United States. Inception date: January 1, 1986

**S&P GSCI:** A composite index of commodities that measures the performance of the commodity market. Inception date: May 7, 2007

**MSCI US REIT Index (daily price return USD):** A free float-adjusted market capitalization weighted index that is comprised of equity Real Estate Investment Trusts (REITs). Inception date: June 20, 2005

**MSCI All Country World Index (Gross USD):** The MSCI All Country World Index is a market capitalization weighted index designed to provide a broad measure of equity-market performance throughout the world. Inception date: May 31, 1990

**LBMA Gold Price PM:** The global benchmark price for unallocated gold delivered, IBA operates electronic auctions for spot, unallocated loco London gold.

**S&P GSCI Crude Oil Index:** Provides a publicly available benchmark for investment performance in the crude oil market. Inception date: May 1, 1991

**S&P Global Clean Energy Index:** Designed to measure the performance of 30 companies from around the world that are involved in clean energy-related businesses. Inception Date: February 22, 2007

## Other Definitions

**Intercontinental Exchange (ICE):** The Intercontinental Exchange is an American company that owns exchanges for financial and commodity markets and operates 12 regulated exchanges and marketplaces.

**Sharpe ratio:** Used to help investors understand the return of an investment compared to its risk. Generally, the greater the value of the Sharpe ratio, the more attractive the risk-adjusted return.

**Standard deviation:** the standard deviation is a measure of the amount of variation or dispersion of a set of values.

**Carbon allowances:** Top 5 carbon allowance markets by constituent trade volume. The Index is used since the index start date July 25, 2019. From 11/30/2016 to prior to the index start date, 60% and 5% were respectively assigned to EUA futures prices (current year and next year December vintages) using Intercontinental Exchange daily published settlement prices, 20% and 5% were respectively assigned to CCA futures (current year and next year December vintages) using IHS Markit OPIS's daily Carbon Market Report published prices, and 10% was assigned to RGGI (current year December vintage) using IHS Markit OPIS's daily Carbon Market Report published prices. Prior to 11/30/2016, 60% and 5% respectively were assigned to EUA futures prices (current year and next year December vintages) using Intercontinental Exchange daily published settlement prices and 35% was respectively assigned to CCA futures (current year December vintage) using IHS Markit OPIS's daily Carbon Market Report published prices. For the two ranges developed prior to the index start date, Intercontinental Exchange and IHS Markit OPIS's Daily Carbon Market Report publish daily pricing for each contract vintage for all relevant days when the futures trade.

**Market Stability Reserve:** The Market Stability Reserve (MSR) holds allowances out of the auction when excess volumes are available on the market and reinjects them when there is low circulation. There is no predetermined price floor or ceiling however this mechanism, creates stability in the market and improves resilience to future spikes in supply/demand.

**Important Notes:**

**Carefully consider the Funds' investment objectives, risk factors, charges and expenses before investing. This and additional information can be found in the Funds' full and summary prospectus, which may be obtained by visiting [www.kraneshares.com/krbn](http://www.kraneshares.com/krbn), [www.kraneshares.com/keua](http://www.kraneshares.com/keua), & [www.kraneshares.com/kcca](http://www.kraneshares.com/kcca). Read the prospectus carefully before investing.**

**Risk Disclosures:**

Investing involves risk, including possible loss of principal. There can be no assurance that a Fund will achieve its stated objectives. Indices are unmanaged and do not include the effect of fees. One cannot invest directly in an index.

This information should not be relied upon as research, investment advice, or a recommendation regarding any products, strategies, or any security in particular. This material is strictly for illustrative, educational, or informational purposes and is subject to change. Certain content represents an assessment of the market environment at a specific time and is not intended to be a forecast of future events or a guarantee of future results; material is as of the dates noted and is subject to change without notice.

The Funds rely on the existence of cap and trade regimes. There is no assurance that cap and trade regimes will continue to exist, or that they will prove to be an effective method of reduction in GHG emissions. Changes in U.S. law and related regulations may impact the way the Funds operate, increase Fund costs and/or change the competitive landscape. New technologies may arise that may diminish or eliminate the need for cap and trade markets. Ultimately, the cost of emissions credits is determined by the cost of actually reducing emissions levels. If the price of credits becomes too high, it will be more economical for companies to develop or invest in green technologies, thereby suppressing the demand for credits. The Funds may invest in derivatives, which are often more volatile than other investments and may magnify the Funds' gains or losses. A derivative (i.e., futures/forward contracts, swaps, and options) is a contract that derives its value from the performance of an underlying asset. The primary risk of derivatives is that changes in the asset's market value and the derivative may not be proportionate, and some derivatives can have the potential for unlimited losses. Derivatives are also subject to liquidity and counterparty risk. The Funds are subject to liquidity risk, meaning that certain investments may become difficult to purchase or sell at a reasonable time and price. If a transaction for these securities is large, it may not be possible to initiate which may cause the Funds to suffer losses. Counterparty risk is the risk of loss in the event that the counterparty to an agreement fails to make required payments or otherwise comply with the terms of derivative.

The use of futures contracts is subject to special risk considerations. The primary risks associated with the use of futures contracts include: (a) an imperfect correlation between the change in market value of the reference asset and the price of the futures contract; (b) possible lack of a liquid secondary market for a futures contract and the resulting inability to close a futures contract when desired; (c) losses caused by unanticipated market movements, which are potentially unlimited; (d) the inability to predict correctly the direction of market prices, interest rates, currency exchange rates and other economic factors; and (e) if the Fund has insufficient cash, it may have to sell securities or financial instruments from its portfolio to meet daily variation margin requirements, which may lead to the Fund selling securities or financial instruments at a loss. The Funds invest through a subsidiary, and is indirectly exposed to the risks associated with the Subsidiary's investments. Since the Subsidiary is organized under the law of the Cayman Islands and is not registered with the SEC under the Investment Company Act of 1940, as such the Funds will not receive all of the protections offered to shareholders of registered investment companies. The Funds and their Subsidiary will be considered commodity pools upon commencement of operations, and each will be subject to regulation under the Commodity Exchange Act and CFTC rules. Commodity pools are subject to additional laws, regulations and enforcement policies, which may increase compliance costs and may affect the operations and performance of the Funds and the Subsidiary. Futures and other contracts may have to be liquidated at disadvantageous times or prices to prevent the Funds from exceeding any applicable position limits established by the CFTC. The value of a commodity-linked derivative investment typically is based upon the price movements of a physical commodity and may be affected by changes in overall market movements, volatility of the Index, changes in interest rates, or factors affecting a particular industry or commodity.

**Risk Disclosures Continued:**

Fluctuations in currency of foreign countries may have an adverse effect to domestic currency values. The Funds are subject to interest rate risk, which is the chance that bonds will decline in value as interest rates rise. Narrowly focused investments typically exhibit higher volatility. The Funds' assets are expected to be concentrated in a sector, industry, market, or group of concentrations to the extent that the Underlying Index has such concentrations. The securities or futures in that concentration could react similarly to market developments. Thus, The Funds are subject to loss due to adverse occurrences that affect that concentration. The Funds are non-diversified.

KRBN, KEUA, and KCCA may underperform other similar funds that do not consider conscious company/ESG guidelines when making investment decisions.

ETF shares are bought and sold on an exchange at market price (not NAV) and are not individually redeemed from the Fund. However, shares may be redeemed at NAV directly by certain authorized broker-dealers (Authorized Participants) in very large creation/redemption units. The returns shown do not represent the returns you would receive if you traded shares at other times. Shares may trade at a premium or discount to their NAV in the secondary market. Brokerage commissions will reduce returns. Beginning 12/23/2020, market price returns are based on the official closing price of an ETF share or, if the official closing price isn't available, the midpoint between the national best bid and national best offer ("NBBO") as of the time the ETF calculates the current NAV per share. Prior to that date, market price returns were based on the midpoint between the Bid and Ask price. NAVs are calculated using prices as of 4:00 PM Eastern Time.

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